Supreme Court, U.S.
FILED
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No. 99-

IN THE

Supreme Court of the United States

LORAL FAIRCHILD CORPORATION,

Petitioner,

v.

SONY CORPORATION and SONY ELECTRONICS, INC.,

Respondents.

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

PETITION FOR A WRIT OF CERTIORARI

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QUESTION PRESENTED

In *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*, 520 U.S. 17 (1997), this Court affirmed the need for the doctrine of equivalents to protect the objectives of the patent system and established guidelines for its use in patent infringement litigation. Since that decision, the Court of Appeals for the Federal Circuit has expressed confusion over the meaning of those guidelines, and members of that court have urged this Court to exercise its certiorari jurisdiction to resolve the debate among its judges. The question presented in this case is:

Whether the Federal Circuit's abandonment of the public notice function limitation on the use of prosecution history estoppel eviscerates the effort of this Court in *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.* to maintain the vitality of the doctrine of equivalents.

PARTIES TO THE PROCEEDING

The petitioner is Loral Fairchild Corporation. Loral Space & Communications Ltd. ("Loral Space"), a publicly held company, retains the right to bring this lawsuit on behalf of and in the name of the Loral Fairchild Corporation. Pursuant to Supreme Court Rule 29.6, Loral Space states that Lockheed Martin Corporation owns more than ten-percent of Loral Space stock. Loral Space also states that it is a parent company of the publicly-traded Globalstar Telecommunications Ltd.

The respondents are Sony Corporation and Sony Electronics, Inc. Other defendants involved in the district court litigation, but not in the appellate proceeding, were Matsushita Electric Industrial Company, Ltd., Matsushita Electric Corporation of America, NEC Corporation, NEC America, Inc., NEC Technologies, Inc., Canon, Inc., Canon U.S.A., Inc., Toshiba Corporation, Toshiba America, Inc. Toshiba America Consumer Products, Inc., Toshiba America Information Systems, Inc., Toshiba America Electronic Components, Inc., Hitachi, Ltd., Hitachi Home Electronics (America), Inc., Fuji Photo Film Co., Ltd., Fuji Photo Film USA Inc., Sanyo Electric Co., Ltd., Sanyo Fisher (USA) Corporation, Mitsubishi Electric Corporation, Mitsubishi Electric Sales America, LG Electronics, Inc., LG Electronics U.S.A., Inc., Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., National Semiconductor Corporation, and Fairchild Semiconductor Corporation.

TABLE OF CONTENTS

	Page
QUESTION PRESENTED	i
PARTIES TO THE PROCEEDING	ii
TABLE OF CONTENTS	iii
TABLE OF CITED AUTHORITIES	v
TABLE OF APPENDICES	vii
OPINIONS BELOW	2
STATEMENT OF JURISDICTION	2
STATUTORY PROVISIONS INVOLVED	2
INTRODUCTION AND STATEMENT	4
I. THE PATENTS-IN-SUIT	7
II. THE LITIGATION	11
A. District Court Proceedings	11
B. Federal Circuit Appeal	12
REASONS FOR GRANTING THE WRIT	13
I. THE PUBLIC NOTICE FUNCTION OF PATENT LAW LIMITS THE APPROPRIATE USE OF PROSECUTION HISTORY ESTOPPEL.	14

Contents

Page

A. *Warner-Jenkinson* Rejected the Unbounded Use of Prosecution History Estoppel. 14

B. The Public Notice Function Limits the Use of Prosecution History Estoppel. . 17

II. THE FEDERAL CIRCUIT HAS INVOKED PROSECUTION HISTORY ESTOPPEL WITHOUT REGARD TO THE PUBLIC NOTICE FUNCTION OF PATENT LAW. 21

A. The Federal Circuit Improperly Relied Upon Non-Public Information Extrinsic to the Prosecution Record. 21

B. The Federal Circuit Failed to Conduct a Scope of Estoppel Analysis. 22

CONCLUSION 25

TABLE OF CITED AUTHORITIES

Page

Cases:

Cardinal Chem. Co. v. Morton, 508 U.S. 83 (1993) 14

Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 172 F.3d 1361 (Fed. Cir. 1999) 22

General Instrument Corp. v. Hughes Aircraft Co., 399 F.2d 373 (1st Cir. 1968) 19, 20

Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605 (1950) 5

Hughes Aircraft Co. v. United States, 140 F.3d 1470, *reh'g en banc denied*, 148 F.3d 1384 (Fed. Cir. 1998) 6, 22

Instituform Techs., Inc. v. Cat Contracting, Inc., 99 F.3d 1098 (Fed. Cir. 1996), *cert. denied*, 520 U.S. 1198 (1997) 20

Irons & Sears v. Dunn, 606 F.2d 1215 (D.C. Cir. 1979) 22

Litton Sys., Inc. v. Honeywell, Inc., 140 F.3d 1449, *reh'g en banc denied*, 145 F.3d 1472 (Fed. Cir. 1998) 4, 6, 19, 22, 23

Cited Authorities

Page

Markman v. Westview Instruments, Inc., 52 F.3d 967 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996) ... 14, 19

Schriber-Schroth v. Cleveland Trust Co., 311 U.S. 211 (1940) 19

Sextant Avionique S.A. v. Analog Devices, Inc., 172 F.3d 817 (Fed. Cir. 1999) 19, 20

Warner-Jenkinson Co. v. Hilton Davis Chemical Co., 520 U.S. 17 (1997) ..... *passim*

Winans v. Denmead, 56 U.S. 330 (1850) 5

Statutes:

28 U.S.C. § 1254 2

35 U.S.C. § 112 ..... 2, 15

35 U.S.C. § 122 ..... 3, 22

35 U.S.C. § 131 ..... 3, 17

35 U.S.C. § 153 ..... 3, 17

35 U.S.C. § 271 4

Other Authority:

Chisum on Patents § 18.01 5

TABLE OF APPENDICES

Page

APPENDIX A — Opinion Of The United States Court Of Appeals For The Federal Circuit Dated And Decided June 8, 1999 ..... 1a

APPENDIX B — Judgment Of The United States District Court For The Eastern District Of New York Dated July 22, 1996 ..... 36a

APPENDIX C — Order Of The United States District Court For The Eastern District Of New York Certifying The Case Between Loral And Sony For Immediate Appeal To The United States Court Of Appeals For The Federal Circuit Under Rule 54(b) Dated July 16, 1996 ..... 38a

APPENDIX D — Opinion And Order Of The United States District Court For The Eastern District Of New York Granting Sony's Motion For Judgment As A Matter Of Law, For A New Trial, And On Prosecution History Estoppel Dated July 12, 1996 ..... 47a

APPENDIX E — Order Of The United States Court Of Appeals For The Federal Circuit Denying Petition For Rehearing Dated And Filed July 16, 1999 ..... 119a

APPENDIX F — Judgment And Jury Verdict Of The United States District Court For The Eastern District Of New York Dated And Filed February 14, 1996 ..... 121a

Appendices

Page

APPENDIX G — Order Of The United States District Court For The Eastern District Of New York Granting In Part And Denying In Part Sony's Motion For A Summary Judgment Of Non-Infringement Of The '485 Patent And Denying Toshiba's Motion For A Summary Judgment Of Invalidity Of The '485 Patent Dated December 15, 1995 ..... 137a

APPENDIX H — Order Of The United States District Court For The Eastern District Of New York Granting In Part And Denying In Part Sony's Motion For A Summary Judgment Of Non-Infringement Of The '674 Patent Dated December 14, 1995 ..... 145a

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ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

PETITION FOR A WRIT OF CERTIORARI

Petitioner Loral Fairchild Corporation ("Loral") respectfully petitions for a writ of certiorari to review the judgment of the United States Court of Appeals for the Federal Circuit in this case.

OPINIONS BELOW

The opinion of the court of appeals (App., *infra*, at 1a-35a) is reported at 181 F.3d 1313. The opinion and order of the district court (App., *infra*, at 47a-118a) is reported at 931 F. Supp. 1014. The judgment of the district court (App., *infra*, at 36a-37a) is not reported.

STATEMENT OF JURISDICTION

The judgment of the court of appeals was entered on June 8, 1999. Loral filed a timely petition for rehearing with suggestion for rehearing *en banc*, which was denied on July 16, 1999. App., *infra*, at 119a-120a. The certiorari jurisdiction of this Court is invoked under 28 U.S.C. § 1254.

STATUTORY PROVISIONS INVOLVED

35 U.S.C. § 112 states in pertinent part:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.
>
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35 U.S.C. § 122 states:

> Applications for patents shall be kept in confidence by the Patent and Trademark Office and no information concerning the same given without authority of the applicant or owner unless necessary to carry out the provisions of any Act of Congress or in such special circumstances as may be determined by the Commissioner.

35 U.S.C. § 131 states:

> The Commissioner shall cause an examination to be made of the application and the alleged new invention; and if on such examination it appears that the applicant is entitled to a patent under the law, the Commissioner shall issue a patent therefor.

35 U.S.C. § 153 states:

> Patents shall be issued in the name of the United States of America, under the seal of the Patent and Trademark Office, and shall be signed by the Commissioner or have his signature placed thereon and attested by an officer of the Patent and Trademark Office designated by the Commissioner, and shall be recorded in the Patent and Trademark Office.

35 U.S.C. § 271 states in pertinent part:

> (a) Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.

INTRODUCTION AND STATEMENT

This case presents an opportunity for this Court to clarify a matter of fundamental importance to patent law: the continued vitality and proper application of the doctrine of equivalents against an expansion of prosecution history estoppel beyond its settled limits.[1] In exercising its certiorari jurisdiction just two terms ago in *Warner-Jenkinson v. Hilton Davis Chemical Co.*, 520 U.S. 17 (1997), this Court took note that there was "significant disagreement within the Court of Appeals for the Federal Circuit" regarding the doctrine of equivalents. *Id.* at 21. This Court took the case to "clarify the proper scope of the doctrine." *Id.* It then unanimously reaffirmed the vitality of the doctrine of equivalents over the argument of petitioners (and four judges of the Federal Circuit in dissent) that the doctrine should be abandoned and instructed the Federal Circuit to "refine the

---

1. Judge Plager of the Federal Circuit has written, "There is perhaps no question more important to the health of patents than the scope and application of the judicially-created doctrine of equivalents. It permeates the entire fabric of patent law, and appears in virtually every case involving patent enforcement." *Litton Sys., Inc. v. Honeywell, Inc.*, 145 F.3d 1472 (Fed. Cir. 1998) (denial of suggestion for rehearing en banc) (Plager, J., dissenting from Order).

formulation of the test for equivalence" announced in *Warner-Jenkinson*. *Id.* at 8.[2]

Despite that instruction, it is apparent that the meaning of this Court's ruling in *Warner-Jenkinson* has become the source of confusion on the Federal Circuit over the relationship between the doctrine of equivalents and prosecution history estoppel, a device that bars a patent-holder from asserting claim coverage that was surrendered during the patent application process.[3] That confusion has led to requests by judges of the Federal Circuit that this Court exercise its certiorari jurisdiction to resolve the controversy. For example, in a recent dissent to the denial of a petition for rehearing in a case involving the scope of prosecution history estoppel, Judge Clevenger wrote,

> [T]he Solicitor General should ask the Supreme Court to grant a writ of certiorari in this case. . . . Cases involving the doctrine of equivalents continue to flow through the federal courts. The question posed . . . in this case is of utmost importance to patent law. A swift answer to the question is needed.

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2. In fact, it appears as if support for the doctrine on this Court has increased over time. *Warner-Jenkinson* was a unanimous decision. This Court's previous support for the doctrine drew spirited dissents. *See Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 613-15 (1950) (Black, J., dissenting); *Winans v. Denmead*, 56 U.S. 330, 347 (1850) (Campbell, J., dissenting).

3. *See Chisum on Patents* § 18.01 ("[A] patent owner may not expand the claim through the doctrine of equivalents so as to recapture subject matter deliberately surrendered during the course of the proceedings in the Patent and Trademark Office to obtain the patent.")

Hughes Aircraft Co. v. United States, 148 F.3d 1384, 1385-86 (Fed. Cir. 1998) (Clevenger, J., dissenting from Order) (denial of petition for rehearing en banc). And in another recent case involving the doctrine of equivalents, Judge Plager wrote in a similar vein, "It is not clear to me exactly what the Supreme Court had in mind when it said that, as a result of an amendment related to patentability, 'prosecution history estoppel would bar the application of the doctrine [of] equivalents as to that element.' " *Litton Sys. Inc. v. Honeywell, Inc.*, 145 F.3d 1472 (Fed. Cir. 1998) (denial of petition for rehearing en banc) (Plager, J., dissenting from Order).[4] The present case presents an important opportunity for this Court to clear up the confusion.

Of particular importance to the present case, *Warner-Jenkinson* held that prosecution history estoppel, carefully applied, is an important limit on the unbounded use of the doctrine of equivalents. The use of estoppel has limits, too. It must serve the public notice function of patent law, the idea that in exchange for the legal protection of a patent the inventor will make full disclosure to the public of what the invention is and how it works. In *Warner-Jenkinson*, this Court rejected a proposal for a vigorous use of estoppel that was not consistent with the public notice function. Petitioner there argued that any amendment to the claim triggered prosecution history estoppel regardless of the reason for the

---

4. *Compare Litton Sys., Inc. v. Honeywell, Inc.*, 145 F.3d 1472, 1473 (Fed. Cir. 1998) (denial of petition for rehearing en banc) (Clevenger, J., dissenting from Order) (noting that the court of appeals was, in his view, reading *Warner-Jenkinson* too narrowly, "[H]opefully, the Supreme Court will have an occasion to decide whether our panel got it right."), *with Litton Sys.*, 145 F.3d at 1478 (Newman, J. concurring) ("[I]t is now apparent that there is more than one view of what was decided in *Warner-Jenkinson*. . . .").

change. To the contrary, this Court insisted that the application and scope of prosecution history estoppel turn on the reasons behind an amendment. To use estoppel without a probe of the mandatory public disclosure intended to provide some certainty to the inventor, the public, and the court regarding the basis and reach of the patent would undermine the public notice function of the law.

In this case, the Federal Circuit did just that. It applied prosecution history estoppel to amended claims without regard to the public notice function by relying on non-public information and failing to engage in an inquiry into the scope of estoppel that this Court requires to protect that function. It has, for all intents and purposes, invoked prosecution history estoppel to bar the use of the doctrine of equivalents simply because a claim was amended — the very use of estoppel this Court expressly repudiated in *Warner-Jenkinson*.

I. THE PATENTS-IN-SUIT

This case arises out of two patents owned by petitioner Loral that each represent key technological breakthroughs in the development of charge coupled devices ("CCDs"), semiconductor chips used as the "seeing eye" in camcorders and many facsimile machines. A CCD, which is part of a light-sensing imager, is a piece of semiconductor material covered with a thin layer of insulation, on top of which is a series of "gate electrodes." App., *infra*, 5a. The purpose of a CCD is to remove charges from the surface of a light-sensing imager in a camcorder rapidly and in an orderly fashion after an image has been recorded. C.A. Jt. App. A3469-70, A3628, A2860-66. In that manner, the imager may record the next image, and the previous image may later be reconstructed. C.A. Jt. App. A3469-

70, A3628. When voltage is applied to one of the gate electrodes on a CCD, it creates a "potential well" in the semiconductor material directly beneath the electrode. App., *infra*, 5a. A packet of electric charge from a pixel — an individual photosite on the surface of the CCD — can be stored in the potential well. By properly manipulating the sequence in which voltage is applied to the gate electrodes, one can cause the charge packets to migrate very rapidly in one direction. This transports the charge packets of the removed image. App., *infra*, 6a.

U.S. Patent No. 3,931,674 (" '674 Patent") represents the first commercially practicable method of producing two-phase CCDs, which were significantly faster and simpler to operate than the prior art three-phase CCDs. C.A. Jt. App. A2866-74, A9741, A9751, A10498-99. Although many major companies had attempted to develop a manufacturable and reliable process to mass produce two-phase CCDs, it was not until Dr. Gilbert Amelio, then at Fairchild Camera and Instrument Corp. ("Fairchild"), invented the '674 Process that such mass production became a reality.[5] C.A. Jt. App. A2874-77, A5668-70, A10498-99. Even today, Dr. Amelio's invention is the *only* commercially practicable process for making CCDs for consumer electronics applications. C.A. Jt. App. A5652-57, A3467-71. That process consists of six key elements, which are recited in the '674 Patent. At the time that Dr. Amelio made his invention, it was well known to persons skilled in the art that the order in which elements 3 and 4 were performed was immaterial. C.A. Jt. App. A2972, A3333-36, A3983, A4014-16, A4890-91.

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5. The term " '674 Process" refers to a process that includes all six elements of the '674 Patent, regardless of the chronological sequence in which elements 3 and 4 are performed.

In the early to mid 1970s, respondents Sony Corporation and Sony Electronics, Inc. ("Sony") conducted research on CCDs, attempting to make its own version of a two-phase CCD using a process employed by most other industry players. Like the rest of the industry, however, Sony found that the "reliability and yield of the process" was unsatisfactory. C.A. Jt. App. A9290-99, A3057-62, A9256. By 1977, Fairchild had commercially introduced CCDs made by the '674 Process. C.A. Jt. App. A9257-73. Sony engineers purchased one of these devices, cut it apart, and conducted a detailed reverse engineering, stripping away each individual layer, to determine the key steps of the '674 Process. *Id.* In recording the results of their analysis, the Sony engineers did not consider the chronological sequence of elements 3 and 4 to have any significance. C.A. Jt. App. A9257-73, A3042-61. After dissecting the Fairchild CCD, Sony abandoned its prior approach and switched exclusively to the '674 Process. C.A. Jt. App. A3057-61, A9290-97. All commercial Sony CCD products introduced since 1980 have been made by processes that include all six elements of the '674 Patent, performed as listed in the '674 Patent, with the sole exception that elements 3 and 4 are reversed. App., *infra*, 8a.

U.S. Patent No. 3,896,485 (" '485 Patent"), invented by Dr. James Early, describes another milestone in semiconductor imaging technology. Since CCD imagers were first developed in 1970, the undesirable spreading of the white areas in a high contrast video image, or "blooming," has been a problem. App., *infra*, 10a. Blooming occurs when light-generated charges in individual pixels on the surface of the CCD chip exceed the capacity of the photosites for storing those charges, and the charges spill over into neighboring photosites. *Id.* Many consumers are familiar with "blooming" from video images taken of a lit birthday cake.

Prior to Dr. Early's invention, companies used "lateral," or "surface," overflow drains to control blooming. These structures permitted excess charges to spill into a drain, or "charge sink," region located *on* the surface of the chip alongside each column of photosites. C.A. Jt. App. A9432. Because the drains were *on* the chip surface, they occupied space that could otherwise have been used for additional photosites to enhance picture clarity. App., *infra*, 10a.

Dr. Early solved this problem by teaching that overflow drains could be formed *beneath* the photosites in order to conserve precious space on the surface area of the chip, thus increasing the chip's resolution. *Id.* Any excess charges generated in the photosite will move vertically downward into the charge sink, and therefore will not contribute to "blooming." *Id.* The '485 Patent also teaches that the vertical overflow structure can be used as an "electronic shutter," which is particularly useful for capturing high speed action (*e.g.*, a golf swing). C.A. Jt. App. A3653-55. Dr. Early's innovation was an unprecedented, breakthrough invention. No one before had sought to place the overflow drain beneath the surface. After Dr. Early's invention, CCD manufacturers throughout the world began to abandon their prior "lateral" overflow drains in favor of Dr. Early's revolutionary "vertical" overflow drain invention for use in high resolution imagers. Indeed, virtually all commercial camcorders sold today contain CCDs incorporating Dr. Early's invention. C.A. Jt. App. A3633, A3641, A9745.

II. THE LITIGATION

A. District Court Proceedings

Loral initiated this case in the fall of 1991, when it sued Sony and other manufacturers of CCD products for widespread infringement of the two patents-in-suit. After pre-trial motions and hearings, the case came on for trial before a jury on the issue of whether Sony's CCDs infringed upon Loral's patents under the doctrine of equivalents. After a five-week trial with 19 witnesses and more than 450 exhibits, the jury, after four days of deliberation, returned a 17-issue set of special verdicts with all but one of those issues answered in favor of Loral.[6] The special verdicts included findings that Sony's accused CCDs infringed both of the patents-in-suit. App., *infra*, 121a-136a. Despite the jury's findings, the judge granted a motion for judgment as a matter of law that Sony did not infringe the two patents-in-suit under the doctrine of equivalents, and found that prosecution history estoppel prevented petitioner Loral from asserting that Sony's accused products and processes infringe either of the patents under the doctrine of equivalents. *Id.* at 116a-117a.

With respect to the '674 Patent, the court held that prosecution history estoppel barred Loral from asserting infringement of the '674 Patent under the doctrine of equivalents of any process where element 4 was performed before element 3. *Id.* at 101a-102a. In reaching this conclusion, the court expressly relied upon Loral's citation of a prior art reference in a confidential, abandoned divisional

6. The sole issue answered in Sony's favor — whether Sony had induced infringement of the '485 Patent — is not germane to the issue in this petition.

application for a CCD *structure*[7] and its omission of that reference from the '674 Patent application itself, which describes a CCD *process*. *Id.* at 100a-102a. With respect to the '485 Patent, the court found that, because "Loral narrowed its claims to avoid rejections based on prior art and to obtain the '485 patent," prosecution history estoppel barred Loral from asserting a range of equivalents for the "charge sink means" element that embraced "more than the specific structure described in the claim language." *Id.* at 65a. The court, however, did not analyze — or even discuss — the scope and content of the prior art compelling such a conclusion, none of which taught the vertical overflow drains claimed in the '485 Patent and used in Sony's CCDs. *See id.* The court then certified the case for immediate appeal to the Federal Circuit under Rule 54(b). *Id.* at 118a.

B. Federal Circuit Appeal

With respect to the '674 Patent, the appellate court affirmed the trial court's finding that prosecution history estoppel barred Loral from asserting infringement under the doctrine of equivalents of a 4-before-3 process. App., *infra*, 31a. Specifically, the panel endorsed the district court's reliance upon Loral's citation of an article in a confidential, abandoned divisional application for a CCD *structure* and its omission of that reference from the application for the '674 Patent, which involves a CCD *process*, to support

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7. The Patent and Trademark Office determined that a claims application for the CCD structure required a separate filing (for review by a different group of examiners) than an application for the CCD process, which is at issue in this litigation. C.A. Jt. App. A8049. Fairchild abandoned the application for the CCD structure. Trial Transcript at 3004-05 (E.D.N.Y. Jan. 30, 1996) (testimony of Bower).

overturning the jury's contrary conclusion.[8] *Id.* at 1326. With respect to the '485 Patent, the panel affirmed the district court's use of prosecution history estoppel. Even though the district court's ruling was based on claim amendments purportedly made to avoid prior art cited by the examiner, the panel did not discuss or analyze the scope and content of the prior art, what was surrendered, or the reasons for the surrender. *Id.* Had it engaged in that analysis as required by *Warner-Jenkinson*, it would have learned that the prior art were all lateral surface drain devices quite different from the vertical drain devices used by Sony and covered by the Early '485 Patent. The court of appeals denied Loral's petition for rehearing. App., *infra*, 119a-120a.

REASONS FOR GRANTING THE WRIT

This case presents an issue of elemental importance to patent law: whether prosecution history estoppel will be used without regard to its public notice function to undermine the doctrine of equivalents. Because the Federal Circuit has exclusive, nationwide appellate jurisdiction over patent suits

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8. Loral proved at trial that Sony's use of an element-4-before-element-3 sequence is an insubstantial change to the '674 Patent. App., *infra*, 121a-136a. The jury so found as a matter of fact, and the judge confirmed that "substantial evidence supports the jury's verdict of infringement under the doctrine of equivalents." App., *infra*, 69a-71a. The judge used prosecution history estoppel to overturn the jury verdict despite ruling before trial that there was a significant factual dispute over whether estoppel should apply based upon the public prosecution record. At trial, the jury found that the prosecution record showed that Loral had not surrendered coverage of the process used by Sony. App., *infra*, 121a-136a. Only then did the judge go beyond the public record to rely on information outside the prosecution history to justify his determination that prosecution history estoppel should apply.

in federal courts, this Court should exercise its certiorari jurisdiction to correct that circuit's deeply flawed use of prosecution history estoppel. This Court should instruct the Federal Circuit that prosecution history estoppel cannot be used in the way it was in this case: to deny a patent-holder the protections of the doctrine of equivalents based on non-public information in an abandoned application or without the court conducting an inquiry into the scope of the estoppel.[9] Otherwise, the doctrine of equivalents will be jeopardized to the detriment of patent-holders and their competitors.

I.

THE PUBLIC NOTICE FUNCTION OF PATENT LAW LIMITS THE APPROPRIATE USE OF PROSECUTION HISTORY ESTOPPEL.

A. *Warner-Jenkinson* Rejected the Unbounded Use of Prosecution History Estoppel.

In *Warner-Jenkinson*, this Court unanimously beat back a challenge to the doctrine of equivalents, affirmed its vitality as an integral part of patent law and claim construction, and identified limits to its proper use. This Court made clear that the doctrine of equivalents still has force, but that its application may be limited, in appropriate cases, by a careful use of prosecution history estoppel that gives due regard to

9. This Court has recognized the special role the Federal Circuit plays in adding uniformity and certainty to the development of patent law and has exercised its certiorari jurisdiction when disputes within the court of appeals have posed a threat to those values. *E.g., Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 390 (1996); *Cardinal Chem. Co. v. Morton*, 508 U.S. 83, 89 (1993).

the public notice function of the Patent Act's claiming requirement. Petitioner in *Warner-Jenkinson* (and four judges who dissented in that case below) urged this Court to abandon the doctrine of equivalents, arguing that it was fundamentally inconsistent with the requirement of the Patent Act that an applicant "particularly point out and distinctly claim" the invention. 35 U.S.C. § 112. This Court rejected that argument in large measure because Congress had made no effort to overrule the doctrine or even alter its use during its more than 150-year life. *Warner-Jenkinson*, 520 U.S. at 28. Tacit congressional endorsement of the doctrine confirms that its use must serve the purposes of the Patent Act.

This Court acknowledged, however, that the doctrine of equivalents had, on occasion, been applied "broadly" in a fashion "unbounded by the patent claims," and, when so used, posed "conflicts with the definitional and public-notice functions of the statutory claiming requirement." *Id.* The remedy for such misuse is not abandonment of the doctrine, but its proper use, consistent with the purposes of the Patent Act. This Court identified prosecution history estoppel as the chief means of keeping the doctrine of equivalents vibrant yet bounded. *Id.* at 30-31. But prosecution history estoppel itself must also be carefully tethered to the purposes of the Patent Act, or it could swallow the doctrine of equivalents altogether. In particular, *Warner-Jenkinson* found that the use of estoppel must support the public notice function of patent law. Application of estoppel must "give[] proper deference to the role of claims in . . . providing public notice. . . . Applied in this fashion, prosecution history estoppel places reasonable limits on the doctrine of equivalents, and further insulates the doctrine from any feared conflict with the Patent Act." *Id.* at 33.

This Court then demonstrated how those limits should be applied when it expressly rejected petitioner's argument for a vigorous application of estoppel not limited by the public notice function. Petitioner in *Warner-Jenkinson* argued that any amendment to the claim, regardless of the reason for the change, should trigger estoppel and thereby deny the patent-holder the protection of the doctrine of equivalents. *Id.* at 29. ("According to petitioner, any surrender of subject matter during patent prosecution, regardless of the reason for such surrender, precludes recapturing any part of that subject matter, even if it is equivalent to the matter expressly claimed. . . . [P]etitioner would have those limits form bright lines beyond which no equivalents may be claimed." *Id.* at 30.) Under the *Warner-Jenkinson* petitioner's proposed bright-line rule, a court would need to make no inquiry beyond the fact that there was an amendment to the claim. The fact of that amendment alone would preclude the patent-holder from arguing that infringement occurred under the doctrine of equivalents, the patent's protection would extend no farther than the literal language of the amended claim in all cases, and there would be no inquiry into the reasons for the amendment.

This Court flatly rejected that proposed bright-line rule, holding that it "reaches too far" to disregard "the reason for an amendment during patent prosecution." *Id.* at 39. After reviewing its own precedents involving the use of prosecution history estoppel, this Court observed, "It is telling that in each case this Court probed the reasoning behind the Patent Office's insistence upon a change in the claims." *Id.* at 31. "Our prior cases have consistently applied prosecution history estoppel only where claims have been amended for a limited set of reasons, and we see no substantial cause for requiring a more rigid rule invoking an estoppel regardless

of the reasons for a change." *Id.* at 31, 32. "What is permissible for a court to explore is the *reason* (right or wrong) for the objection and the manner in which the amendment addressed and avoided the objection." *Id.* at 33 (emphasis added). After *Warner-Jenkinson*, it is fundamental that prosecution history estoppel cannot properly be applied absent an inquiry into the reasons for the amendment to the claim.

B. The Public Notice Function Limits the Use of Prosecution History Estoppel.

An inquiry into the claims prosecution record to determine the reasons for an amendment is driven by and must be consistent with the public notice function of the patent system. At the core of that system is a statutory bargain between the inventor and the public. The inventor can achieve the patent rights he seeks, which justify investment in innovation, only by agreeing to give clear notice to the public, through the claims, of what the invention is and how it works. The inventor takes away from this bargain the right to exclude others from making, using, or selling the invention. Absent that right, inventors' incentives to invest in innovation diminish. The public takes away from this bargain the benefits of new knowledge, which can spur further development, and notice, so that competitors can tailor their innovations to steer clear of infringement. This statutory bargain works only if there is a free-flow of accurate information from the inventor to the public. To take from the bargain that which it is intended to achieve, the inventor and the public must be able to rely on the written record that is created during the prosecution of the patent application, which is made available to the public upon the grant of the patent. 35 U.S.C. §§ 131, 153. Mandating public disclosure

of an invention is intended to provide some measure of certainty regarding the reach of the patent claim. The disclosure is valuable to inventors, competitors, and, when there are allegations of infringement, the courts.

Judge Gajarsa of the Court of Appeals for the Federal Circuit described this public notice function (in a dissent in which he took aim at the Federal Circuit's approach to prosecution history estoppel after *Warner-Jenkinson*):

> Patents provide inventors with a legal right, for a limited time, to exclude others from using, selling, offering to sell, or manufacturing the invention. In essence, patents give their owners significant power over the development of technology and markets by giving patentees the right to exclude others from using their inventions. For this privilege, the government extracts a *public disclosure* of the invention in the hope that, among other things, the disclosure of all inventions will add to the sum total of knowledge available to the general public. Competitors and the markets, as well as the courts, must be able to ascertain what subject matter is covered by this right to exclude. *Public notice* of the scope of the right to exclude, as provided by the patent claims, specification and prosecution history, is a critical function of the entire scheme of patent law. The notice function is critical because it provides competitors with the necessary information upon which they can rely to shape their behavior in the marketplace.

Litton Sys., Inc. v. Honeywell, Inc., 145 F.3d 1472, 1474 (Fed. Cir. 1998) (Gajarsa, J., dissenting from Order) (denial of petition of rehearing en banc) (emphasis added); *accord Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 978-79 (Fed. Cir. 1995) ("It is only fair (and statutorily) required that competitors be able to understand what is the scope of the patent owner's rights by obtaining the patent and prosecution history — '*the undisputed public record*,' — and applying established rules of construction to the language of the patent claim in the context of the patent." (emphasis added)), *aff'd*, 517 U.S. 370 (1996); *see also Sextant Avionique S.A. v. Analog Devices, Inc.*, 172 F.3d 817, 831 (Fed. Cir. 1999) ("the *public* should be able to assess the literal scope of claims and effective extension of claim scope under the doctrine of equivalents with reasonable certainty." (emphasis added)); *Litton Sys., Inc. v. Honeywell, Inc.*, 140 F.3d 1449, 1458 (Fed. Cir. 1998) (observing that prosecution history estoppel may be applied even without a claim amendment if the patentee surrendered coverage in a manner so "clear and unmistakable" that the "*public* [might] reasonably rely" on the surrender (emphasis added)).

The basis for inquiry into the reasons for any change to the claim during the prosecution of the patent were well-established before *Warner-Jenkinson*. In 1940, this Court wrote in *Schriber-Schroth v. Cleveland Trust Co.*, "It is a rule of patent construction consistently observed that a claim in a patent as allowed must be read and interpreted *with reference to claims that have been canceled or rejected*, and the claims allowed cannot by construction be read to cover what was thus eliminated from the patent." 311 U.S. 211, 220-21 (1940) (emphasis added). In *General Instrument Corp. v. Hughes Aircraft Co.*, the court explained the scope of the inquiry: "A reviewing court — and a trial court — must therefore scrutinize *the patent office*

proceedings with as much care as it does the disclosures and claims in the patent itself." 399 F.2d 373, 385-86 (1st Cir. 1968) (emphasis added). As the Federal Circuit itself recently recognized in *Sextant*, "The Supreme Court in *Warner-Jenkinson* held that whether prosecution history estoppel applied to limit the doctrine of equivalents depended on the reason disclosed *in the prosecution history* for the amendment to the claim."[10] 172 F.3d at 827-28 (emphasis added); *see also Instituform Techs., Inc. v. Cat Contracting, Inc.*, 99 F.3d 1098, 1107-08 (Fed. Cir. 1996) (standard for determining scope of prosecution history estoppel "depends on what a competitor, reading *the prosecution history*, would reasonably conclude was given up by the applicant") (emphasis added), *cert. denied*, 520 U.S. 1198 (1997). The inquiry into the reasons for a claim amendment, required by *Warner-Jenkinson*, must search the public prosecution record, the statutorily-created repository of information upon which patent-holders, competitors, and the courts are to rely when making determinations regarding the scope of a patent.

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10. The majority in *Sextant* also emphasized that prosecution history is *intrinsic* to the patent process. 172 F.3d at 825 (emphasis added). The dissent even pointed out that the Federal Circuit has never before suggested that the public notice function of patent law would require competitors to look beyond the file history of the application in suit. *Id.* at 836 (Smith, J., dissenting).

II.

THE FEDERAL CIRCUIT HAS INVOKED PROSECUTION HISTORY ESTOPPEL WITHOUT REGARD TO THE PUBLIC NOTICE FUNCTION OF PATENT LAW.

In *Warner-Jenkinson*, this Court refused to use prosecution history estoppel in a way that would have failed to protect the public notice function of patent law. 520 U.S. at 17. Yet, that is precisely what the Federal Circuit has done here. It has applied prosecution history estoppel without regard to whether its use would serve the public notice function. In this case, the Federal Circuit invoked estoppel based on non-public information filed in an abandoned application and failed to conduct an inquiry concerning the scope of any estoppel based on the public prosecution history record.

A. The Federal Circuit Improperly Relied Upon Non-Public Information Extrinsic to the Prosecution Record.

The Federal Circuit has dealt a serious blow to the public notice function by invoking estoppel in this case on the basis of non-public information extrinsic to the history prosecution record. The panel's reliance on those confidential filings to apply prosecution history estoppel to the '674 Patent is not only legally and factually wrong,[11] but more significant for this Court, it abandons the public notice function so critical to the limits on prosecution history estoppel that this Court insisted upon in *Warner-Jenkinson*. It seems obvious that

11. The non-public information relied upon by the court was part of an abandoned application for a CCD *structure*. The '674 Patent is for a CCD *process*.

relying upon confidential material not in the public record to determine the reach of a patent subverts the public notice function. Pending patent application materials are confidential. 35 U.S.C. § 122. That cloak extends to abandoned applications. *Id.* "The need for confidentiality. . . . seems close to the core of the patent system." *Irons & Sears v. Dunn*, 606 F.2d 1215, 1221 (D.C. Cir. 1979). The records of the abandoned divisional patent application relied upon here by the court of appeals are not publicly available. They are not part of the mandatory disclosure required of the inventor as part of the claims application process. They do not define the patent-holder's claim, and no reasonable competitor would even be aware of such records, let alone rely upon them. Such confidential filings are simply not part of the prosecution history record. Because they are not, they should not be used to invoke prosecution history estoppel.

B. The Federal Circuit Failed to Conduct a Scope of Estoppel Analysis.

Since *Warner-Jenkinson*, the Federal Circuit has issued a series of decisions establishing a two-step analytical framework for application of prosecution history estoppel. *E.g., Litton Sys., Inc. v. Honeywell, Inc.*, 140 F.3d 1449, *reh'g en banc denied*, 145 F.3d 1472 (Fed. Cir. 1998); *Hughes Aircraft Co. v. United States*, 140 F.3d 1470, *reh'g en banc denied*, 148 F.3d 1384 (Fed. Cir. 1998); *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 172 F.3d 1361 (Fed. Cir. 1999). The first step involves a determination, based on a careful analysis of the written prosecution record, of the "reasons" for which amendments or arguments were made. In general, amendments or arguments "made to avoid prior art" give rise to an estoppel, while amendments or arguments made to overcome indefiniteness or nonenablement

rejections do not. *E.g., Litton*, 140 F.3d at 1457-58. If the first step shows that prosecution history estoppel applies, the court then proceeds to the second step of determining the scope of the estoppel. The standard is whether one of ordinary skill in the art would objectively conclude from the written prosecution record that an applicant surrendered particular subject matter. To apply this standard, the court must consider: (a) the content of the prior art cited in the prosecution record against the patent; (b) the applicant's explanation of the specific prior art features that the claim avoided; and (c) whether the accused product has either the same, or a trivial variation of, such prior art features. *See, e.g., Litton*, 140 F.3d at 1461-62.

Here, the trial court overturned unanimous jury verdicts of infringement on two patents on the basis of prosecution history estoppel without even attempting to conduct a scope analysis. Had it done so, a review of the specific prior art references cited during prosecution of the '674 Patent would confirm the jury finding that there was no surrender of a particular order involving elements 3 and 4. In particular, the relevant patents actually cited in the public prosecution record show that the order of elements 3 and 4 were used interchangeably. The use of a particular chronological order of those elements could not possibly have been a "prior art feature" that the applicant sought to avoid. Accordingly, the scope of any alleged estoppel arising from the prosecution of the '674 Patent cannot extend to this particular feature.

Likewise, although the panel asserted that prosecution history estoppel applied to the '485 Patent, it never made a determination as to the "scope" of any alleged estoppel. The panel ignored the express statements of the examiner explaining his reasons for rejection, and never considered

the specific content of the cited prior art references that the applicant amended his claim to avoid. The prosecution record shows that the claim language was amended to avoid *surface drain* prior art and that all of the references cited by the examiner disclosed only *surface drain* features — *i.e.*, drains formed on the surface of the chip that used up scarce areas that might otherwise be used for light sensors to enhance resolution. The accused Sony CCDs do not use such a surface drain structure. Instead, Sony uses a *vertical* overflow drain that has the same function, location, and operation as the vertical overflow structure taught and claimed in the '485 Patent. The prosecution record makes no mention of any *vertical* overflow structures in the prior art — indeed, no such structures existed prior to Dr. Early's pioneering invention. A vertical structure that frees up surface area is a fundamental breakthrough taught by the '485 Patent and is the reason Dr. Early's invention is now used in virtually every CCD video camera sold today. The scope of any estoppel regarding surface drains simply has no application with respect to the Sony devices.

By failing to engage in a scope of estoppel inquiry, required by *Warner-Jenkinson* and its own precedents, the Federal Circuit has cut prosecution history estoppel free from the public notice function it must serve. The effect is an expanded use of estoppel beyond its limits. The result is that the Federal Circuit has done what this Court rejected in *Warner-Jenkinson*.

CONCLUSION

The petition for a writ of certiorari should be granted.

Respectfully submitted,

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October 14, 1999

APPENDIX

APPENDIX A — OPINION OF THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT DATED AND DECIDED JUNE 8, 1999

United States Court of Appeals for the Federal Circuit

97-1017

LORAL FAIRCHILD CORPORATION,

Plaintiff-Appellant,

v.

SONY CORPORATION and SONY ELECTRONICS INC.,

Defendants-Appellees,

and

MATSUSHITA ELECTRIC INDUSTRIAL COMPANY, LTD., MATSUSHITA ELECTRIC CORPORATION OF AMERICA, NEC CORPORATION, NEC AMERICA, INC., NEC TECHNOLOGIES, INC., CANON, INC., CANON U.S.A., INC., TOSHIBA CORP., TOSHIBA AMERICA, INC., TOSHIBA AMERICA CONSUMER PRODUCTS, INC., TOSHIBA AMERICA INFORMATION SYSTEMS, INC., TOSHIBA AMERICA ELECTRONIC COMPONENTS, INC., HITACHI, LTD., HITACHI HOME ELECTRONICS (AMERICA), INC., FUJI PHOTO FILM CO., LTD., FUJI PHOTO FILM USA INC., SANYO ELECTRIC CO., LTD., SANYO FISHER (USA) CORP., MITSUBISHI ELECTRIC CORP., MITSUBISHI ELECTRIC SALES AMERICA, LG ELECTRONICS INC., LG ELECTRONICS U.S.A.,

Appendix A

INC., SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC., NATIONAL SEMICONDUCTOR CORPORATION, AND FAIRCHILD SEMICONDUCTOR CORP.,

Defendants.

DECIDED: June 8, 1999

Before MICHEL, *Circuit Judge*, ARCHER, *Senior Circuit Judge*,* and PLAGER, *Circuit Judge*.

ARCHER, *Senior Circuit Judge*.

Loral Fairchild Corporation (Loral) appeals the July 23, 1996 judgment of the United States District Court for the Eastern District of New York, No. 91-CV-5056, holding that Sony Corporation and Sony Electronics, Inc. (Sony) did not infringe Loral's patents. As pertinent here, the court held on summary judgment that Sony did not literally infringe United States Patent No. 3,931,674 (the '674 patent) and, contrary to the jury's verdict, that it also did not infringe the patent under the doctrine of equivalents. The court also held, again contrary to the jury's verdict, that Sony did not infringe United States Patent No. 3,896,485 (the '485 patent) under the doctrine of equivalents.[1] We affirm.

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* Senior Circuit Judge Glenn L. Archer, Jr. vacated the position of Chief Judge on December 24, 1997.

1. The court granted Sony's motion for summary judgment of literal non-infringement of the '485 patent but this has not been appealed.

Appendix A

BACKGROUND

I. *Procedural Background*

Loral, assignee of the '674 and '485 patents, brought an infringement suit against a number of Japanese electronics manufacturers including those who manufacture and sell semiconductors and consumer electronic devices and those who purchase semiconductors and manufacture consumer electronic devices.[2] The district court resolved a number of issues as a matter of law clarifying and limiting the issues that needed to go to trial. *See Loral Fairchild Corp. v. Victor Co. of Japan, Ltd.*, 906 F.Supp. 813 (E.D.N.Y. 1995) (granting defendants' motion for summary judgment on marking). In connection with its preliminary holdings, the district court held a two day "Markman hearing" to resolve the claim construction issues. *See Loral Fairchild Corp. v. Victor Co. of Japan, Ltd.*, 906 F.Supp. 798 (E.D.N.Y. 1995) (construing disputed claims of the patents).

Following the construction of the claims, Sony moved for summary judgment that it neither literally infringed nor infringed under the doctrine of equivalents either of the patents at issue. The court granted Sony's motion of no literal infringement as to both patents, but denied the motion as to infringement under the doctrine of equivalents. *See Order Granting in Part Sony's Motion for Summary Judgment of Non-Infringement of the '674 Patent* (Civil Action Nos. 92-

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2. The proceedings against this latter group of defendants was severed and stayed after they agreed to be bound by certain rulings made in the cases against the manufacturing defendants from whom they purchased the semiconductors.

0128-ARR, 91-5056-ARR, December 14, 1995); *Order Granting in Part and Denying in Part Sony's Motion for Summary Judgment of Non-Infringement of the '485 Patent and Denying Toshiba's Motion for Summary Judgment on Invalidity of the '485 Patent* (Civil Action Nos. 92-0128-ARR, 91-5056-ARR, December 15, 1995).

Concerned about potential prejudice to the defendants in this case, the court also separated the trial of each of the manufacturing defendants. Sony's trial proceeded first.

The trial was held in January 1996 on the issues of ownership, infringement under the doctrine of equivalents, and validity. After five weeks of trial, the jury was given a detailed set of written instructions with integrated special verdicts for separate factual issues. After four days of deliberation, the jury found that Loral owned both patents, that Sony infringed both patents under the doctrine of equivalents and had induced infringement of the '674 patent, and that Sony failed to prove that any of the claims at issue were invalid.

Following the verdict, the court considered Sony's motion for judgment as a matter of law, and in the alternative, for a new trial. The court granted Sony's motion, holding, *inter alia*, that infringement of the '674 patent was precluded by prosecution history estoppel[3] and that infringement of the

---

3. The district court granted Sony's JMOL motion pertaining to infringement under the doctrine of equivalents of the '674 patent on three grounds: first, that the Erb article is § 102(a) prior art; second, that the work of Drs. Erb and Su which culminated in the

(Cont'd)

'485 patent could not stand under a proper claim interpretation. *Loral Fairchild Corp. v. Victor Co. of Japan, Ltd.*, 931 F.Supp. 1014 (E.D.N.Y. 1996). The case was certified for appeal to this court under Fed. R. Civ. P. 54(b).

II. *The Technology*

The patents at issue describe inventions in semiconductor technology known as charge coupled devices (CCD). This technology has proven useful in devices where there is a need to store a continuously changing image such as camcorders, cameras, copiers, and facsimile machines.

The imager of a camcorder, for example, localizes on its surface electrical charges created from light to which it has been exposed into an array of many small points, or pixels, each of which can contain a packet of electrical charge, thus defining a picture corresponding to the view that the user intends to record. The CCD, which collects the charges associated with the changing image, is part of a semiconductor structure further housing a thin layer of nonconductive insulation and a series of gate electrodes on the top surface of the material. When voltage is applied to one of these gate electrodes it creates a "potential well" in the semiconductor substrate beneath the electrode. A packet of electrical charge representing a pixel can be stored in the potential well, and by alternately applying two different

---

(Cont'd)
article is § 102(g) prior art; and third, that prosecution history estoppel applies. Because we agree with the district court as to the third ground we need not consider the first two grounds for granting JMOL.

voltages to adjacent gate electrodes, the charge packets can be forced to move through the semiconductor substrate in one direction. By transporting the charge packets, the image is stored and removed to allow the next image to be stored. Backward movement of the charge packets is prevented by ion implanted barriers.

A. *The '674 Patent*

The '674 patent claims a six step process for fabricating a self-aligned CCD. It was invented by Dr. Gilbert F. Amelio. At issue here is claim 1 which reads:

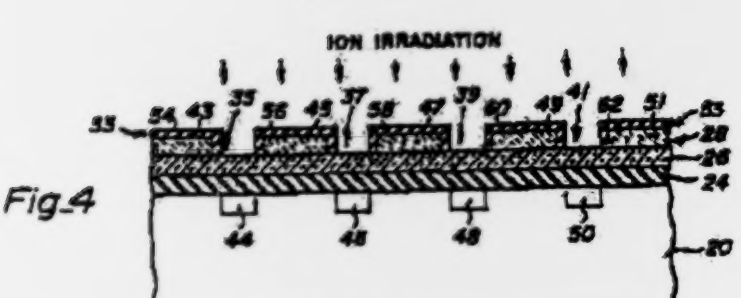
> 1. A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of
>
> > [1] selectively applying at least one layer of insulation material to said semiconductor substrate;
> >
> > [2] selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;
> >
> > [3] forming a first insulation layer over said plurality of first gate electrodes;
> >
> > [4] forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of

> spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the vertical edges of the insulation layer on the respective first gate electrodes;
>
> [5] selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, each of said second gate electrodes substantially occupying the space between adjacent first gate electrode, and
>
> [6] connecting each of said second gate electrodes to an individual adjacent first gate electrode to form a composite electrode for a charge coupled element.

[Bracketed numbers added to facilitate reference.]

The sequence of steps in the claim defines an insulated gate masking process. *See* Fig. 4 of the '674 patent below. The insulated gate is used as a mask when the ion implantation barriers are established. When the ions are implanted, the insulated gate blocks implantation into the semiconductor substrate directly below it, resulting in implantation limited to the regions (44, 46, 48, 50) between the gate electrodes. The insulation (54, 56, 58, 60, 62) covers the first gate electrodes (43, 45, 47, 49, 51) when the ions are implanted.

Appendix A



Loral brought suit against Sony claiming that Sony's process of fabricating CCDs infringed the '674 patent. Sony's fabrication process is an uninsulated or naked gate masking process. It is undisputed that the Sony process performs all the steps of the '674 process; however, it performs step four prior to step three. In Sony's process the ion implantation occurs prior to the insulation on the first gate electrodes. Thus, the gate alone, rather than the gate with insulation on it, serves as the mask in the Sony process.

Prior to the trial, the district court construed claim 1 of the '674 patent to require formation of the insulation layer over the first gate electrodes before implantation of the barrier regions. In other words, the claim requires a chronological process sequence with step three preceding step four. *See Loral*, 906 F. Supp. at 806. Under this construction, the court granted summary judgment in favor of Sony holding that there was no literal infringement because its process performs claimed step four before step three. However, the court denied the motion for summary judgment on infringement under the doctrine of equivalents.

When the case proceeded to trial the jury found that Sony's fabrication process infringed claim 1 of the '674

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patent under the doctrine of equivalents. The jury also found that Sony did not prove prosecution history estoppel and that Sony's process was not covered by the prior art.

On Sony's motion for JMOL, the court rejected the jury's advisory verdict on the issue of prosecution history estoppel and held that prosecution history estoppel barred a finding that Sony infringed claim 1 of the '674 patent under the doctrine of equivalents. The court held that during prosecution the patentee limited his claim to insulated gate masking (i.e. performing step three before step four), and that Loral was estopped from recapturing naked gate masking through the doctrine of equivalents.

B. *The '485 Patent*

The '485 patented technology was invented by Dr. James M. Early. Claim 1 of the '485 patent reads:

> 1. Structure which comprises:
>
> a. a light sensing element comprising a first region of semiconductor material overlaid by a first electrode separated from said semiconductor material by insulation, said light sensing element being capable of containing a charge packet;
>
> b. an adjacent region of said semiconductor material disposed for receiving said charge packet from said light sensing element;

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Appendix A

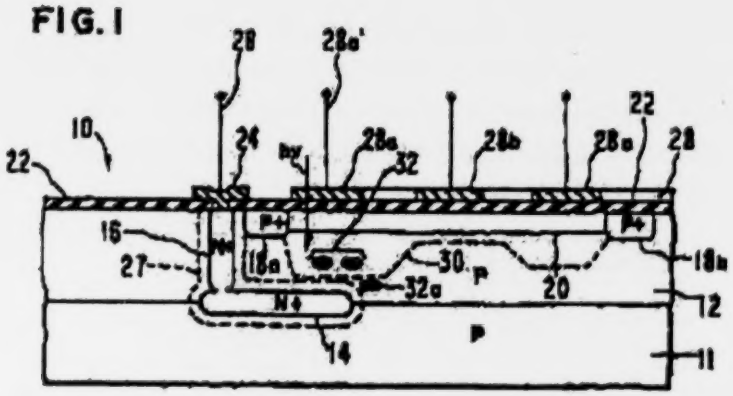
> c. means for controlling the transfer of said charge packet from said light sensing element to said adjacent regions; and
>
> d. *charge sink means* having a contact for applying a bias thereto *buried within* said semiconductor material and disposed for receiving excess charge accumulated in said light sensing element, said charge sink means extending laterally from said contact toward said light sensing element while beneath the surface of said semiconductor material.

(Emphasis added.)

The '485 patent teaches a vertical overflow drain for a CCD to limit "blooming." Blooming is the spreading of light on a video image which distorts the image. It occurs because a pixel on the surface of the CCD has a limited capacity to store electrical charge. When the pixel is full, the excess electrical charge will overflow into the adjacent pixels causing a distortion of the image being recorded. To prevent blooming, a CCD includes an overflow structure to store and dissipate the excess charge from the light sensing elements. Initially, lateral overflow drains located adjacent to the pixels were created. However, surface overflow drains occupied valuable light sensing space on the chip's surface. The '485 patent teaches a vertical overflow drain located below the pixel where the excess electrical charge will drain downward into the charge sink (the N-type region). *See* Fig. 1 of the '485 patent below.

Appendix A

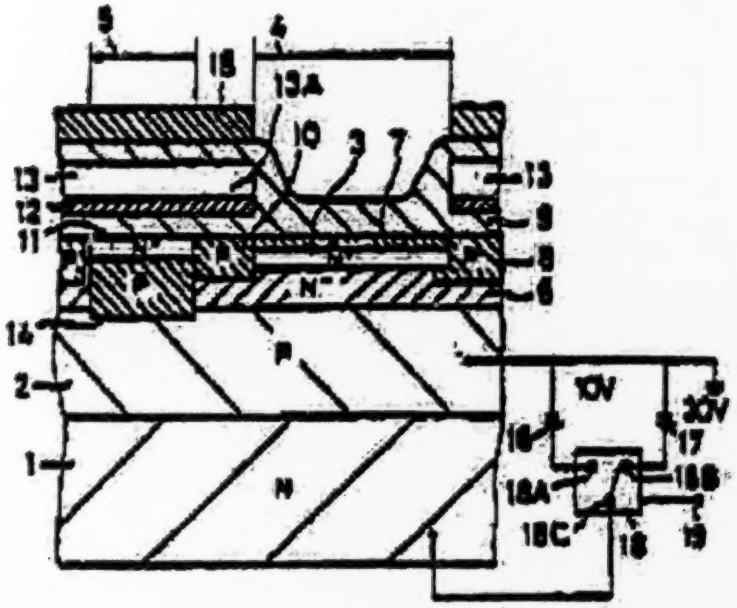
FIG. 1



The district court construed the "charge sink means" of claim 1 of the '485 patent as describing a means-plus-function limitation. It held that the charge sink means is a region of semiconductor material doped opposite to the surrounding semiconductor material. In the above figure, the charge sink means is the eliiptical region (14) with an N+ doping. The surrounding semiconductor material is a P-type substrate. The charge sink region extends from the ohmic contact region (16) toward the light sensing element (28a). The electrical lead (26) is connected to the metallic conducting material (24) so that external electrical contact may be established with the buried charge sink region (14). The electrons (32) are accumulated in the potential wells defined by the dashed lines (30). When excess electrons (32a) accumulate in the potential wells, they will overflow into the charge sink region (14). The court held that the charge sink means of claim 1 of the '485 patent is a separate and distinct structure surrounded by and submerged in the semiconductor material.

Sony's CCDs also permit excess charge accumulation to drain vertically beneath the pixels. However, in Sony's

device the entire N-type substrate acts as a vertical overflow drain, as illustrated below. In Sony's device, the contacts (18A, 18B, 18C) are connected to the N-type substrate and to the power supply sources (16, 17).



See Fig. 1 of Yonemoto U.S. Patent 4,875,100 (Sony Trial Ex. 705, Case No. 91-CV-5056-ARR).

Prior to trial, the court granted summary judgment in favor of Sony holding that there was no literal infringement. The jury found that Sony infringed under the doctrine of equivalents. On Sony's motion for JMOL, the district court held that no reasonable jury could find infringement under the doctrine of equivalents because Sony had no equivalent to the charge sink means of claim 1 of the '485 patent. In addition, the court held that Loral limited its claim scope to

overcome prior art during prosecution to a charge sink which is a separate structure buried within the substrate, extending parallel to the surface from a contact toward the light sensor. Accordingly, the district court held that Loral was estopped by the prosecution history from claiming that Sony infringed under the doctrine of equivalents.

DISCUSSION

We review the district court's grant of summary judgment of no literal infringement *de novo*, *see Conroy v. Reebok Int'l, Ltd.*, 14 F.3d 1570, 1575, 29 USPQ2d 1373, 1377 (Fed. Cir. 1994), with all justifiable factual inferences being drawn in favor of the party opposing summary judgment. *See Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255 (1986). Summary judgment is appropriate when there is no genuine issue of material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(c).

We also review the court's grant of JMOL under Fed. R. Civ. P. 50(a) *de novo*. *See Burroughs Wellcome Co. v. Barr Lab. Inc.*, 40 F.3d 1223, 1227, 32 USPQ2d 1915, 1919 (Fed. Cir. 1994). On appeal, we apply the same standard as did the district court — examining the record in the light most favorable to the non-movant and drawing inferences in its favor to determine if substantial evidence supports the jury verdict. *See id.* We affirm the JMOL if the jury's factual findings are not supported by substantial evidence or if the jury's legal conclusions, express or implied, cannot be supported by those findings. *See Anderson*, 477 U.S. at 250; *Burroughs Wellcome*, 40 F.3d at 1227, 32 USPQ2d at 1919.

Appendix A

I. *The '674 Patent*

A. *Literal Infringement*

An infringement analysis entails two steps: (1) the claims must be construed; and (2) the properly construed claims must be compared to the allegedly infringing device. *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976, 34 USPQ2d 1321, 1326 (Fed. Cir. 1995) (in banc) *aff'd*, 116 S. Ct. 1384 (1996). Claim construction is a question of law that we review *de novo*. *Id.* at 981-983, 34 USPQ2d at 1331-33. In construing the claims, the court looks to the patent itself, the prosecution history, and, if necessary, extrinsic evidence. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582-83, 39 USPQ2d 1573, 1576-77 (Fed. Cir. 1996). Whether the properly construed claims read on Sony's accused products is a question of fact. *See Charles Greiner & Co. v. Mari-Med Mfg., Inc.*, 962 F.2d 1031, 1034, 22 USPQ2d 1526, 1528 (Fed. Cir. 1992).

We agree with the district court's claim construction. Claim 1 of the '674 patent recites a process sequence requiring formation of the insulation layer over the first gate electrodes prior to implantation of the barrier regions. The relevant part of the claim language states:

> [3] forming a first insulation layer over said plurality of first gate electrodes;
>
> [4] forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes,

> *the edges of said implanted barrier regions being aligned with the vertical edges of the insulation layer* on the respective first gate electrodes;

(Emphasis added.) By the literal language of the claim, the edges of the implantation barrier regions are aligned with the edges of the insulation layer; hence, the insulation layer must already be in place in order to align the barrier regions with it during ion implantation. The specification supports this construction. The specification teaches that the "ion-implanted barrier regions . . . are vertically aligned with the respective outer edges of the thermally-grown thin oxide layer." The reference to the thermally-grown oxide layer is the insulation layer. Nowhere does the specification suggest implanting the barrier regions prior to growing the insulation layer.

The prosecution history also supports this interpretation. During prosecution, the patent applicant limited his claim to the sequence of steps enumerated:

> The Examiner has rejected claims 17-24 and 26 under 35 U.S.C. § 112 as vague and indefinite. In particular, the Examiner points out that in the original claim the implanted regions are not, in fact, aligned with the first gate electrode but are aligned with the oxide surface covering the first gate electrodes. The cancellation of claim 18 and the addition of a new step to claim 17 as well as additional language in claim 17 results in the correct recitation that the implanted barriers are aligned with the vertical edges of the first

insulation layer over the respective first gate electrodes.

This language clarifies what the applicant saw as his invention, namely, that the ion implanted regions are aligned with the oxide covering of the gate, not the gate itself, thereby limiting the claim to insulated gate masking — the performance of step three prior to step four. In response to a rejection under 35 U.S.C. § 102 that the claims were unpatentable over Walden, U.S. Patent No. 3,852,799, in view of Boleky, U.S. Patent No. 3,745,647, the applicant also argued that "the present invention is directed to a process *sequence* . . . . This *sequence* of steps goes far beyond the teaching of Boleky and, therefore, is not rendered obvious by it." (Emphasis added.) This language in the prosecution history supports the construction of claim 1 as limited to performance of the sequence of process steps in chronological order.

Although not every process claim is limited to the performance of its steps in the order written, the language of the claim, the specification and the prosecution history support a limiting construction in this case. Accordingly the claim was properly construed as only covering a fabrication process where insulation is formed prior to ion implantation. It is not disputed that the Sony process implants barrier regions prior to forming insulation, and we therefore affirm the district court's grant of summary judgment of no literal infringement of the '674 patent.

Appendix A

B. *Infringement Under the Doctrine of Equivalents*

The jury returned a special verdict finding that Sony's fabrication process infringed claim 1 of the '674 patent under the doctrine of equivalents and that Sony failed to prove prosecution history estoppel.[4]

In *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17 (1997), the Supreme Court endorsed the continued vitality of the doctrine of equivalents. Because the doctrine of equivalents "has taken on a life of its own, unbounded by the patent claims," the Court held that the doctrine must be applied as an objective inquiry on an element-by-element basis. *Id.* at 28-29. More importantly to this case, the Court affirmed that prosecution history estoppel continues to be a defense to infringement. *Id.* at 40 ("Prosecution history estoppel continues to be available as a defense to infringement . . .").

The touchstone of prosecution history estoppel is that a patentee is unable to reclaim through the doctrine of equivalents what was surrendered or disclaimed in order to obtain the patent. *Warner-Jenkinson*, 520 U.S. at 30; *see also Cybor Corp. v. FAS Tech. Inc.*, 138 F.3d 1448, 1460, 46 USPQ2d 1169, 1178 (Fed. Cir. 1998) (in banc); *Hughes Aircraft Co. v. United States*, 140 F.3d 1470, 1476, 46 USPQ2d 1285, 1290 (Fed. Cir. 1998); *Litton Systems, Inc. v. Honeywell, Inc.*, 140 F.3d 1449, 1456, 46 USPQ2d 1321, 1325 (Fed. Cir. 1998); *Pall Corp. v. Micron Separations,*

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4. The jury also found that neither the article nor the antecedent work of Dr. Erb and Dr. Su were prior art and therefore did not limit the application of the doctrine of equivalents.

Inc., 66 F.3d 1211, 1219, 36 USPQ2d 1225, 1231 (Fed. Cir. 1995), *cert. denied*, 117 S. Ct. 1243 (1997).

Prosecution history estoppel applies to matter surrendered as a result of amendments to overcome patentability rejections, *see Warner-Jenkinson*, 520 U.S. at 30-31; *Cybor*, 138 F.3d at 1460, 46 USPQ2d at 1178, and as a result of argument to secure allowance of a claim. *See, e.g., Wang Lab., Inc. v. Mitsubishi Elec., Inc.*, 103 F.3d 1571, 1578, 41 USPQ2d 1263, 1269 (Fed. Cir. 1997); *Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 952, 28 USPQ2d 1936, 1939 (Fed. Cir. 1993); *Texas Instruments Inc., v. United States Int'l Trade Comm'n*, 988 F.2d 1165, 1174-75, 26 USPQ2d 1018, 1025 (Fed. Cir. 1993).

In its analysis of prosecution history estoppel, the Supreme Court in *Warner-Jenkinson* articulated a rebuttable presumption that arises whenever an amendment to a claim is made but the reason for that amendment is not shown by the patentee.

> Mindful that claims do indeed serve both a definitional and a notice function, we think the better rule is to place the burden on the patent-holder to establish the reason for an amendment required during patent prosecution. The court then would decide whether that reason is sufficient to overcome prosecution history estoppel as a bar to application of the doctrine of equivalents to the element added by that amendment. Where no explanation is established, however, the court should presume that the PTO had a substantial

> reason related to patentability for including the limiting element added by amendment. In those circumstances, prosecution history estoppel would bar the application of the doctrine [sic, of] equivalents.

520 U.S. at 33.

Here, the rebuttable presumption would not apply because the applicant provided an explanation regarding the amendments to the claims during prosecution. Nevertheless, the reasons those amendments were made are relevant in determining what subject matter was disclaimed. *See id.* at 33 n.7 ("What is permissible for a court to explore is the reason (right or wrong) for the objection and the manner in which the amendment addressed and avoided the objection."); *see also Hughes Aircraft*, 140 F.3d at 1476, 46 USPQ2d at 1290 ("In evaluating the reason behind an amendment, a court must determine what subject matter the patentee actually surrendered."); *Litton Systems*, 140 F.3d at 1456, 46 USPQ2d at 1325 ("[T]he reason for claim amendments remains relevant to application of [prosecution history] estoppel.").

Prosecution history estoppel is a legal question subject to *de novo* review on appeal. *See Cybor*, 138 F.3d at 1460, 46 USPQ2d at 1178. Thus, we review, without deference to the district court, whether the amendments made to the claims during prosecution of the application had a purpose related to patentability which would give rise to an estoppel and, if so, what claim coverage had been surrendered.

Appendix A

As originally filed, claim 1 of the application resulting in the '674 patent read:

> 1. A process for fabricating a semiconductor structure comprising the steps of:
>
> [1] selectively forming a plurality of spaced-apart first gate electrodes;
>
> [2] selectively forming a second gate electrode between and spaced slightly apart from adjacent ones of said first gate electrodes; and
>
> [3] forming barrier regions in a semiconductor substrate beneath said second gate electrodes, said barrier regions extending in said substrate beyond a boundary defined by the outer perimeter of said second gate electrodes, thereby providing barrier regions having outer boundaries precisely aligned between the boundaries of said first and said second gate electrodes.

[bracketed numbers added to facilitate reference].

As originally filed, claim 2 of the application resulting in the '674 patent read:

> 2. The process as recited in claim 1 and further comprising the step of forming a first insulation

> layer over said first gate electrodes *prior to* the step of forming barrier regions in said semiconductor substrate, whereby the outer lateral surfaces of said first insulation layer are aligned with the correspondent surface of said barrier regions.

(Emphasis added).

Original claim 1 provided no explicit order of the claimed process steps, and thus would cover both naked and insulated gate masking processes. Original claim 2 specified that insulation occur "prior to" formation of barrier regions in the semiconductor substrate, *i.e.*, insulated gate making processes.

By preliminary amendment, before an office action on the merits issued, the applicant canceled claims 1-10 and added claims 17-27. New claims 17 and 18 read:

> 17. A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of:
>
> [1] selectively applying at least one layer of insulation material to said semiconductor substrate;
>
> [2] selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;

Appendix A

[3] forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the respective first gate electrodes; and

[4] selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, one of said second gate electrodes substantially occupying the space between each of said plurality of first gate electrodes.

[bracketed numbers added to facilitate reference].

> 18. The process recited in claim 17 further comprising the step of forming a first insulation layer over said plurality of first gate electrodes *prior to* the step of forming implanted barrier regions in said semiconductor substrate, whereby the edges of said implanted barrier regions are aligned with the vertical edges of the first insulation layer on the respective first gate electrodes. (emphasis added).

Like originally filed claim 1, claim 17 still claimed both naked and insulated gate processes. Furthermore, claim 18,

like claim 2, included the limitation of forming the insulation layer "prior to" forming implanted barrier regions in the substrate.

The Examiner rejected claims 17 and 18 on the merits as being vague and indefinite under 35 U.S.C. § 112:

> In claim 17, the edges of the implanted regions are not aligned with the first gate electrodes but are aligned with the oxide surface covering the first gate electrodes and it is not clear that only one second electrode occupies the spaces between all of the first gate electrodes. Also, no apparent relationship has been set forth between the two sets of gate electrodes and the barrier region.

The Examiner also rejected claims 17 and 18 "under 35 U.S.C. § 103 as unpatentable over Walden [U.S. Patent No. 3,852,799] in view of Boleky [U.S. Patent No. 3,745,647]" because the examiner "considered [it] obvious that the oxide surrounding Walden's first electrodes 46, 49 etc. may be used as mask in forming his regions 43, 53 etc[.], as in Boleky at 20."[5]

In response to the rejection under 35 U.S.C. § 112, the applicant stated that:

---

5. Claim 17 was additionally rejected under 35 U.S.C. § 102 as anticipated by either Krambeck (U.S. Patent No. 3,735,156) or Doo (U.S. Patent No. 3,796,928). As this aspect of the prosecution history was not relied upon by the district court, we do not consider it further.

Appendix A

[T]he Examiner has rejected claims 17-24 and 26 under 35 U.S.C. § 112 as vague and indefinite. In particular, the Examiner points out that in the original claim the implanted regions are not, in fact, aligned with the first gate electrode but are aligned with the oxide surface covering the first gate electrodes. The cancellation of claim 18 and the addition of a new step to claim 17 as well as additional language in claim 17 results in the correct recitation that the implanted barriers are aligned with the vertical edges of the first insulation layer over the respective first gate electrode.

After amendment, claim 17 read:

17. (amended) A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of:

[1] selectively applying at least one layer of insulation material to said semiconductor substrate;

[2] selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;

[3] *forming a first insulation layer over said plurality of first gate electrodes*;

Appendix A

[4] forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the *vertical edges of the insulation layer on the* respective first gate electrodes; and

[5] selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, one of said second gate electrodes substantially occupying the space between each of said plurality of first gate electrodes[.], *each of said second gate electrodes comprising in combination with an individual adjacent first gate electrode a composite electrode for a charge coupled element.*

[bracketed numbers added to facilitate reference, additions underlined, deletions in brackets].[6]

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6. Claim 17 was further amended by Examiner's amendment at the close of prosecution. Claim 17 was renumbered as claim 1 when the '674 patent issued.

Appendix A

In response to the rejection under 35 U.S.C. § 103, the applicant argued:

> It is submitted that the thrust of the Boleky reference is the lateral inward diffusion of the dopant impurities as shown by the points of penetration 40. The use of the insulated gate as a mask shows a technique that is generally known in the semiconductor art. The present invention is directed to a process *sequence* which includes this masking feature as one step but which further includes the unique and distinctive steps of connecting a single first gate electrode to a single adjacent second gate electrode to form a composite gate electrode. Thus, not only is self-alignment of the implanted barriers obtained, but a composite electrode for inclusion in a charge-coupled element is formed. This *sequence* of steps goes far beyond the teaching of Boleky and, therefore, is not rendered obvious by it.

(Emphasis added).

We must examine the reasoning behind the amendment to determine if it was made for purposes of patentability. *See Warner-Jenkinson*, 520 U.S. at 33 & n.7, 40. Loral argues that the indefiniteness rejection under §112 and the subsequent amendment were in response to a drafting error by the prosecuting attorney when the preliminary amendment was filed replacing claims 1-10 with claims 17-27. Thus, Loral asserts that the amendments were not made to overcome prior art, *i.e.*, not for purposes of patentability,

but only to clarify the alignment of the various components formed in the process.

The district court held that, although ostensibly the applicant amended claim 17 only in response to an indefiniteness rejection under § 112, and not to a rejection under § 102 or § 103 based on prior art, the applicant's double reference to the process "sequence" and direct reference to the Boleky prior art patent when arguing with respect to the § 103 rejection was to the contrary. Moreover, the district court found support for this conclusion in the applicant's contemporaneous prosecution of a divisional application directed to the semiconductor device itself. In that divisional application, the independent claim covered structures made by both naked and insulated gate masking processes. During examination, that claim was rejected under § 102 in light of the article written by Dr. Erb which disclosed structures formed by a naked gate masking process. More importantly, the applicant failed to cite the Erb article to the Examiner in the related process application which issued as the '674 patent. The district court held that because the only difference between the Erb process and the '674 process was naked versus insulated gate masking, respectively, the failure to cite Erb in the process application (and the subsequent abandonment of the device claim in light of the Erb rejection) evidenced the applicant's reliance on that difference in order to avoid citing Erb as "crippling prior art."

We agree with the district court that the amendments made during prosecution were made in response to prior art and thus were made for purposes of patentability. An applicant may not avoid the conclusion that an amendment

was made in response to prior art by discussing the amendment under the rubric of a clarification due to a § 112 indefiniteness rejection. *Cf. Sextant Avionique, S.A. v. Analog Devices, Inc.*, __ F.3d __, __, 49 U.S.P.Q.2d 1865, 1873 (Fed. Cir. 1999). If that were permitted amendments made in response to a § 102 or § 103 rejection would tend to be disguised as responding to the § 112 rejection in an attempt to avoid the creation of prosecution history estoppel. As noted above, *Warner-Jenkinson* directs that an examination of the reasoning behind an amendment must be made in order to determine what subject matter, if any, was surrendered. 520 U.S. at 33 n.7.

The applicant's double reference to a process "sequence" in response to the § 103 rejection over Walden in view of Boleky indicates that the applicant intended a specific order to the process steps in the claims, as the district court held. Further, the cancellation of claim 18 which claimed insulated gate masking processes and the inclusion of much of the canceled claim language in claim 17 is persuasive evidence of an intent on the part of the applicant to disclaim naked gate processes. Specifically, additional step [three] in claim 17 of "forming a first insulation layer over said plurality of first gate electrodes" and the additional language in step [four] where the edges of the implanted barrier regions are to be aligned with the "vertical edges of the insulation layer" are direct quotations from canceled claim 18. To be sure, the language "prior to" from claim 18 was not incorporated into claim 17. Yet, the placement of the insulation step [three] before the implantation step [four] in combination with the cancellation of claim 18 further demonstrates the applicant's surrender of subject matter was directed to naked gate processes.

We also consider important, as discussed by the district court, that the applicant was aware of the disclosure of naked gate processes in Dr. Erb's article, citing it in the contemporaneous divisional application directed to the semiconductor device. The district court noted that the difference between the claimed invention and the disclosure in Dr. Erb's article was that the latter was directed to naked masking process.

Based on the totality of the evidence surrounding the prosecution of the '674 patent we are convinced that the district court correctly held that the amendments were made for purposes related to patentability in response to prior art and not solely to correct drafting errors as Loral asserts. Because application claim 17 (claim 1 of the '674 patent) was amended for the purposes of patentability, prosecution history estoppel now precludes Loral from reclaiming the subject matter surrendered by that amendment. The subject matter surrendered was directed to naked gate masking processes. Thus, Loral cannot assert the doctrine of equivalents against Sony's accused process which unquestionably involved exactly those naked gate masking processes.

Finally, Loral argues that the discussion in response to the § 103 rejection indicates that amended claim 17 still encompassed both naked and insulated gate processes. In particular, Loral relies upon the statement that "[t]he use of the insulated gate as a mask shows a technique that is generally known in the semiconductor art." Loral asserts that this admission indicates that the Examiner could not have relied on the distinction between naked and insulated gate processes as the reason for granting the patent. Furthermore,

Loral notes that the Krambeck patent cited by the Examiner and the testimony of Sony's expert witnesses clearly indicate the interchangeability of naked and insulated gate masking processes and the obviousness of one over the other. Thus, Loral argues that naked gate processes could not be subject matter which the applicant disclaimed through amendment. Rather, Loral relies on the statement that "[t]he present invention is directed to a process sequence which includes this masking feature as one step but which further includes the unique and distinctive steps of connecting a single first gate electrode to a single adjacent second gate electrode to form a composite gate electrode."

If this were the only pertinent part of the prosecution history, Loral's argument might have appeal. However, the entire record must be analyzed using an objective standard to determine what has been surrendered during prosecution. *See Modine Mfg. Co. v. United States Int'l Trade Comm'n*, 75 F.3d 1545, 1555, 37 USPQ2d 1609, 1616 (Fed. Cir. 1996). As we have discussed, the amendment to claim 17 inserting verbatim most of the language of canceled claim 18, the references to the "sequence" of the process steps, and the pertinence that Dr. Erb's article, discussed in the abandoned divisional application, would have had if a naked gate masking process had been claimed, are sufficient to demonstrate a surrender by the applicant of naked gate masking processes.[7] This is so, notwithstanding the

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7. Because it is not necessary to our decision, we express no opinion on the district court's conclusion of an "unmistakable surrender or abandonment" of naked gate processes even if the amendments were made solely to address the § 112 rejection. *Loral*, 931 F. Supp. at 1038.

applicant's own general characterization of the distinguishing features of the invention in responding to the § 103 rejection.

We agree with the district court that prosecution history estoppel bars Loral's claim of infringement of the '674 patent under the doctrine of equivalents.

II. *The '485 Patent*

The jury found that Sony's CCDs infringed the '485 patent under the doctrine of equivalents. On motion for JMOL, the district court held that no reasonable jury could have found that Sony's devices infringed because they contained no equivalent structure to the claimed charge sink means and that prosecution history estoppel bars infringement under the doctrine of equivalents. We agree.

A. *The "All Elements" Rule*

The disputed portion of claim 1 of the '485 patent reads:

> d. *charge sink means* having a contact for applying a bias thereto *buried within* said semiconductor material and disposed for receiving excess charge accumulated in said light sensing element, said charge sink means extending laterally from said contact toward said light sensing element while beneath the surface of said semiconductor material.

(Emphasis added). The doctrine of equivalents requires that the accused device have an identical or equivalent element

for each limitation contained in the claim — sometimes known as the "all elements" rule. *See Warner-Jenkinson* 520 U.S. at 18, 29 ("Each element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole. It is important to ensure that the application of the doctrine, even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety."). *See also Dolly, Inc. v. Spalding & Evenflo Cos.*, 16 F.3d 394, 399, 29 USPQ2d 1767, 1769 (Fed. Cir. 1994); *Perkin-Elmer Corp. v. Westinghouse Elec. Corp.*, 822 F.2d 1528, 1532-33, 3 USPQ2d 1321, 1324-25 (Fed. Cir. 1987); *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 935, 4 USPQ2d 1737, 1739-40 (Fed. Cir. 1987) (in banc).

Claim 1 of the '485 patent and the specification define the charge sink means both as to structure and location. The specification calls for a distinct region of semiconductor material doped opposite to the surrounding semiconductor material. The claim language locates this structure as "buried within the semiconductor material" and provides that it "extend[s] laterally [i.e., parallel to the surface] from said contact toward said light sensing element while beneath the surface of the semiconductor material." The district court properly construed the claim to mean:

> "Claim 1 of the '485 patent defines the charge sink means as a distinct structure of semiconductor material doped opposite from its surrounding semiconductor material. The

> claim also locates that structure within the semiconductor material. According to the claim, the charge sink means must extend parallel to the top surface of the semiconductor and perpendicular to a contact toward a light sensing element."

Loral, 931 F.Supp. at 1023.

The court also noted that Fig. 1 of the '485 patent reproduced above, "provides excellent depiction of the location of the charge sink structure." *Id.* at 1019. The prosecution of the '485 patent fully supports the district court's claim interpretation and indicates that only a narrow range of equivalents can be afforded the charge sink location and structure.

The district court determined that Sony's accused devices do not contain an equivalent to the claimed charge sink means and therefore cannot infringe. In the Sony device, the entire substrate functions as charge sink. There is no structure doped opposite to the surrounding semiconductor material as required by the claims of the '485 patent. Because the entire substrate functions as a charge sink in the Sony device, nothing is "buried within" the substrate as the claim requires. Sony also has no charge sink structure extending laterally from the contact to the light sensing element. Finally, Sony's substrate is not "beneath the surface" as contemplated by the claim language. Accordingly, it is quite clear that Sony's device contains no equivalent to the precisely described charge sink in the '485 patent. The district court correctly held that Sony cannot infringe under the doctrine of equivalents.

Appendix A

B. *Prosecution History Estoppel*

We also agree with the district court that prosecution history estoppel would bar Loral from claiming that Sony's devices infringe under the doctrine of equivalents. Prosecution history estoppel is a question of law that we review *de novo*. *See Cybor*, 138 F.3d at 1460, 46 USPQ2d at 1178.

When the application for claim 1 of the '485 patent was first filed, the charge sink limitation read:

> charge sink means buried within said semiconductor material and disposed in proximity to said light sensing element for receiving excess charge accumulated in said light sensing element.

The examiner rejected application Claim 1 and other claims on the ground that "these claims do not recite the location of the charge sink region other than it be within the semiconductor material' and adjacent to the light sensitive element. This reads on surface diffused sinks like [the prior art]." In response, application Claim 1 was amended to read:

> charge sink means buried within said semiconductor material and disposed for receiving excess charge accumulated in said light sensing element, said charge sink means extending laterally toward said light sensing element while beneath the surface of said semiconductor material.

Appendix A

In response to additional objections by the examiner, the claim was further amended to better define the location of the charge sink means. Because these amendments were made to overcome the examiner's prior art based rejections, Loral is estopped from reclaiming the relinquished subject matter. We agree with the district court that Loral is limited to a charge sink means that is a separate structure buried within the substrate, extending laterally from a contact toward the light sensor. Prosecution history estoppel bars Loral from recapturing under the doctrine of equivalents claim scope encompassing the Sony device.

The district court, therefore, correctly granted JMOL to Sony that it did not infringe the '485 patent.

CONCLUSION

For the reasons set forth above, the judgment of the district court is affirmed.

AFFIRMED

APPENDIX B — JUDGMENT OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK DATED JULY 22, 1996

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

92-CV-0128 (ARR)

LORAL FAIRCHILD CORPORATION,

Plaintiff,

– against –

VICTOR COMPANY OF JAPAN, LTD., et al.,

Defendants.

LORAL FAIRCHILD CORPORATION,

Plaintiff,

– against –

MATSUSHITA ELECTRICAL INDUSTRIAL COMPANY, LTD., et al.,

Defendants.

An order of Honorable Randall R. Rader, United States Circuit Judge, sitting by intercircuit assignment, having been filed on July 22, 1996, entering final judgment under Fed. R. Civ. P. 54(b) in favor of the Sony defendants and against

the plaintiff, Loral Fairchild Corp., on Loral's claim for patent infringement against Sony and certifying the case for immediate appeal; and, as set forth in paragraph 5 of the February 23, 1996 Order, staying Loral's claims against the remaining defendants pending resolution of this appeal by the United States Court of Appeals for the Federal Circuit, it is

ORDERED and ADJUDGED that final judgment is hereby entered in favor of the Sony defendants and against the plaintiff, Loral Fairchild Corp., on Loral's claim for patent infringement against Sony; that the case is certified for immediate appeal; and, that Loral's claims against the remaining defendants are stayed pending resolution of that appeal by the United States Court of Appeals for the Federal Circuit.

Dated: Brooklyn, New York
July 22, 1996

ROBERT C. HEINEMANN
Clerk of Court

By: s/ James Giokas
James Giokas
Chief Deputy Clerk

APPENDIX C — ORDER OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK CERTIFYING THE CASE BETWEEN LORAL AND SONY FOR IMMEDIATE APPEAL TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT UNDER RULE 54(B) DATED JULY 16, 1996

LORAL FAIRCHILD CORPORATION,
Plaintiff,

v.

VICTOR COMPANY OF JAPAN, LTD., et al., Defendants.

LORAL FAIRCHILD CORPORATION,
Plaintiff,

v.

MATSUSHITA ELECTRIC INDUSTRIAL COMPANY, LTD., et al., Defendants.

Civil Action Nos. 91-5056-ARR, 92-0128-ARR.

United States District Court,
E.D. New York.

July 16, 1996.

* * *

Appendix C

ORDER CERTIFYING THE CASE BETWEEN LORAL AND SONY FOR IMMEDIATE APPEAL TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT UNDER RULE 54(B)

RANDALL R. RADAR, Circuit Judge (Sitting by Designation).

In this patent case, Loral Fairchild Corporation joined numerous Japanese electronics manufacturing companies in a single civil action for infringement of two United States patents. Defendants vigorously compete against each other in the electronics industry in the manufacture and sale of semiconductor devices as well as in the sale of consumer electronics products such as cameras, VCRs, and camcorders.

Some defendants manufacture semiconductor devices and consumer electronic devices. Other defendants only make and sell consumer electronics devices. These latter defendants purchase semiconductor devices for their consumer products from the other group of defendants. This same consumer defendant group sought to be severed and stayed from this case. They agreed to be bound by certain rulings made in the cases against the manufacturing defendant from whom they purchased chips. The court granted that motion. Six so-called manufacturing defendants remained — Sony, Sanyo, Toshiba, Hitachi, NEC, and OKI.

In view of the Federal Circuit's (now the Supreme Court's) decision in *Markman v. Westview Instruments, Inc.*, 52 F.3d 967 (Fed.Cir.1995) (en banc), *aff'd on other grounds*, __ U.S. __, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996), the

court ordered briefing on claim construction and scheduled a hearing to receive qualified expert testimony on the meaning of the claims. For this proceeding, the court allotted plaintiff and defendants each two expert witnesses. This joint proceeding clarified that a jury trial with all six manufacturing defendants would present logistical difficulties. For example, each defendant wanted an opportunity to question witnesses — sometimes on repetitive points, other times on issues unique to a particular defendant's interests. Each defendant also sought to participate in oral argument — sometimes raising redundant points, other times presenting confusing corollaries or even points conflicting with another defendant.

Following the hearing, several defendants moved for separate trials. The various defendants cited a number of potential problems associated with a joint trial. For example, defendants foresaw potential unfair prejudice in trying a case with a single United States plaintiff against a large group of Japanese defendants. According to defendants, they would confront the prospect of making Goliath seem sympathetic against David, but would confront that task before an audience of Hebrews. In addition, defendants highlighted the substantial increased trial time and expense resulting from a joint trial.

Defendants also expressed concern over the handling of sensitive trade secrets in the presence of other defendants, who may have the right to have a representative remain in the courtroom at all times. Finally, Loral apparently has accused more than 150 products and many processes of infringement of its two patents. Defendants believed the jury

would face difficulty in considering each of their unique products and processes separately for infringement. Finding substantial merit in defendants concerns, on October 11, 1995, the court separated the trials of the six manufacturing defendants and established a trial schedule with the Sony defendants first.

The case proceeded to trial between Loral and Sony in January 1996, on the issues of ownership, infringement under the doctrine of equivalents, and validity of the asserted claims of the patents-in-suit. After five weeks of trial and several days of deliberations, the jury returned a verdict on February 14, 1996. The jury found Loral had proven it owned the two patents and that Sony infringed the asserted claims of the patents under the doctrine of equivalents. The jury also reported that Loral had proven Sony induced infringement of only the '674 patent. However, the jury reported that Sony did not prove invalidity of any of the asserted claims of the patents-in-suit.

Following this verdict, Sony moved for judgment as a matter of law and for a new trial. The court also tried the issues of laches and equitable estoppel to the bench in April 1996.

On July 12, 1996, the court granted Sony's motion for judgment as a matter of law and for a new trial, in the alternative. The court found insufficient evidence under applicable law to support the jury's verdicts on infringement of the '485 and '674 patents.

On July 16, 1996, the court held a telephone conference with counsel regarding possible certification of this case

under Fed.R.Civ.P. 54(b) for immediate appeal. The parties raised no objection to this procedure. Having finally resolved all liability issues between Loral and Sony but with pending claims against the other defendants, the court believes no just reason for delay exists, dictating an immediate appeal of this matter to the United States Court of Appeals for the Federal Circuit under Fed.R.Civ.P. 54(b). This is the court's order certifying this case for appeal.

DISCUSSION

Federal Rule of Civil Procedure 54 authorizes a court to certify a final judgment for immediate appeal notwithstanding the fact that other issues remain for resolution. Fed.R.Civ.P. 54(b). Rule 54(b) reads:

> When more than one claim for relief is presented in an action, whether as a claim, counterclaim, cross-claim, or third-party claim, or when multiple parties are involved, the court may direct the entry of a final judgment as to one or more but fewer than all of the claims or parties only upon an express determination that there is no just reason for delay and upon an express direction for the entry of judgment.

Fed.R.Civ.P. 54(b).

Rule 54 provides a mechanism to "avoid the possible injustice of a delay in entering judgment . . . as to fewer than all of the parties until the final adjudication of the entire case by making an immediate appeal available." 10 Charles

Alan Wright, Arthur R. Miller & Mary Kay Kane, *Federal Practice and Procedure* § 2654, at 35 (2d ed. 1983). Under Rule 54, consistent with a trial court's intimate involvement in a case, the court has wide discretion to enter judgment when it terminates the action as to one party. *Curtiss-Wright Corp. v. General Elec. Co.*, 446 U.S. 1, 8, 100 S.Ct. 1460, 1464-65, 64 L.Ed.2d 1 (1980); *Sears, Roebuck & Co. v. Mackey*, 351 U.S. 427, 437, 76 S.Ct. 895, 900, 100 L.Ed. 1297 (1956). The rule requires a definite statement of certification by the district court, which provides notice to the parties as to the time for appeal. *Flynn & Emrich Co. v. Greenwood*, 242 F.2d 737, 739 (4th Cir.), *cert. denied*, 353 U.S. 976, 77 S.Ct. 1060, 1 L.Ed.2d 1137 (1957).

According to the Supreme Court, district courts must undertake a two-step inquiry in evaluating whether to certify a case for appeal under Rule 54. *Curtiss-Wright*, 446 U.S. at 7, 100 S.Ct. at 1464. First, the court must determine whether there is a final decision. *Id.* Second, the court must determine that there is no just reason for delay. *Id.* at 8, 100 S.Ct. at 1464-65.

To satisfy the first prong in a case featuring multiple parties, the court must finally adjudicate a claim as to one of the parties. *See Farrell v. Piedmont Aviation, Inc.*, 411 F.2d 812, 814-15 (2d Cir.), *cert. denied*, 396 U.S. 840, 90 S.Ct. 103, 24 L.Ed.2d 91 (1969). The claim at issue in this case is one for patent infringement. *W.L. Gore & Assoc., Inc. v. International Medical Prosthetics Res. Assoc., Inc.*, 975 F.2d 858, 863 (Fed.Cir.1992). Loral and Sony have fully tried Loral's claim for infringement and all of Sony's asserted defenses. The court has ruled as a matter of law that Sony's

accused processes and CCDs do not infringe the asserted claims of the patents-in-suit. With that ruling, nothing remains to be litigated between Loral and Sony. Sony, however, did not prove invalidity of any of the asserted claims of the patents-in-suit. Thus, Loral's claims for patent infringement against the other defendants remain pending in this case. Consequently, consistent with Rule 54, this court has finally resolved a claim between one but not all of the parties.

In addition, the court must also determine that there is no just reason for delay. *In re Chateaugay Corp.*, 928 F.2d 63, 64 (2d Cir.1991) (per curiam); *see also New York v. United States,* 568 F.2d 887, 893 n. 10 (2d Cir.1977). No precise formula has been approved to determine the necessity for immediate appeal. *Curtiss-Wright,* 446 U.S. at 10-11, 100 S.Ct. at 1466-67. Instead, consistent with the discretionary nature of the decision, courts should examine the particular facts and circumstances of each case in deciding whether there is no just reason for delay. *Id.*

Several factors in this case point toward certification. First, resolution of the decided issues on appeal may facilitate settlement with the remaining defendants. *New York v. AMRO Realty Corp.*, 936 F.2d 1420, 1426 (2d Cir.1991). A number of the remaining defendants manufacture CCDs using a four-before-three process sequence. Affirmance of this court's decision regarding liability of that process sequence under the '674 patent may lessen the potential liability of the defendants who manufacture CCDs using that sequence and lead to settlement.

Second, this court's claim construction drove the resolution of the issues between Sony and Loral. Claim construction impacted significantly on this court's conclusions on literal and equivalents infringement on both patents. Currently, the Federal Circuit does not defer to trial court rulings on claim construction. *See Maxwell v. J. Baker, Inc.*, 86 F.3d 1098, 39 USPQ2d 1001, 1004-05 (Fed.Cir. 1996). Thus, the Federal Circuit may adopt a different view of the claims at issue. With a number of trials remaining, the Federal Circuit's guidance on the proper scope of the claims will clarify the parties' rights and obligations under the patents and may lead to a substantial savings of time and expense. *National Fuel Gas Distribution Corp. v. TGX Corp.*, 950 F.2d 829, 834 (2d Cir.1991).

Third, as alluded to previously, immediate appeal may result in a substantial savings of time, resources, and expense. Should the Federal Circuit affirm this court's claim construction and rulings on the doctrine of equivalents, the case can proceed against the remaining defendants with relative ease. However, should the Federal Circuit reverse, this court may only have to retry the case between Loral and Sony, as opposed to retrial of all the cases should appeal await the end of those trials. Thus, immediate appeal serves to save both valuable time and judicial resources as well as expense.

CONCLUSION

In sum, the facts and circumstances of this case point toward immediate certification. The case is finally resolved between Loral and Sony, yet claims remain against the other

defendants. Moreover, the court finds no just reason for delay. Consequently, the court will certify this judgment as final under Rule 54(b) and certify the case for immediate appeal.

Consequently, IT IS HEREBY ORDERED as follows:

1. As no just reason for delay exists, the Clerk shall enter final judgment under Fed.R.Civ.P. 54(b) in favor of the Sony defendants and against the plaintiff, Loral Fairchild Corp., on Loral's claim for patent infringement against Sony.

2. As set forth in paragraph 5 of the February 23, 1996, order, Loral's claims against the remaining defendants continue to remain stayed pending resolution of this appeal by the United States Court of Appeals for the Federal Circuit.

APPENDIX D — OPINION AND ORDER OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK GRANTING SONY'S MOTION FOR JUDGMENT AS A MATTER OF LAW, FOR A NEW TRIAL, AND ON PROSECUTION HISTORY ESTOPPEL DATED JULY 12, 1996

LORAL FAIRCHILD CORPORATION,
Plaintiff,

v.

VICTOR COMPANY OF JAPAN, LTD., et al., Defendants.

LORAL FAIRCHILD CORPORATION,
Plaintiff,

v.

MATSUSHITA ELECTRIC INDUSTRIAL COMPANY, LTD., et al., Defendants.

Civil Action Nos. 92-0128-ARR, 91-5056-ARR.

United States District Court,
E.D. New York.

July 12, 1996.

* * *

Appendix D

OPINION

RADER, Circuit Judge (Sitting by Designation).

In this patent case, Loral Fairchild Corporation sued numerous Japanese electronics companies for infringement of United States Patents 3,931,674 (the '674 patent) and 3,896,485 (the '485 patent). In August 1995, the court severed and stayed all of the non-manufacturing consumer defendants, leaving six core groups of manufacturing defendants — Sony, Sanyo, Toshiba, Hitachi, NEC, and OKI. On October 11, 1995, the court ordered separate trials for each of the six groups of manufacturing defendants and scheduled trial dates for each.

Over the course of five weeks in January and February, 1996, Loral Fairchild Corporation (Loral) and Sony Electronics, Inc. and Sony Corporation (Sony) tried the issues of ownership, validity, and infringement of the two patents to a jury. On February 14, 1996, the jury returned a verdict finding that Loral owns the patents, that Sony did not prove invalidity of the asserted claims, and that Loral had proven infringement. The jury also found that Sony induced infringement of the '674 patent but did not induce infringement of the '485 patent. After the verdict, Sony moved for judgment as a matter of law (JMOL) or for a new trial.

Loral and Sony then tried the remaining liability issues to the court on April 15 and 16, 1996. This Opinion is the court's decision on Sony's post-trial motion as well as the court's findings of fact and conclusions of law on prosecution history estoppel, equitable estoppel, and laches.

Appendix D

Because no reasonable jury could find that Sony infringed the two patents, this court grants Sony's motion for judgment as a matter of law. In addition, this court finds prosecution history estoppel prevents Loral from asserting the doctrine of equivalents to cover Sony's accused products. However, this court finds that neither equitable estoppel nor laches bar recovery in this suit.

BACKGROUND

This court has issued several opinions in this case which discuss the technology, the patents, and the claims. *See Loral Fairchild Corp. v. Victor Co. of Japan,* 911 F.Supp. 76 (E.D.N.Y.1996) (imposing discovery sanction); *Loral Fairchild Corp. v. Victor Co. of Japan,* 906 F.Supp. 813 (E.D.N.Y.1995) (granting defendants' motion for summary judgment on marking); *Loral Fairchild Corp. v. Victor Co. of Japan,* 906 F.Supp. 798 (E.D.N.Y.1995) (construing disputed claims of the patents). This opinion builds on the foundation of those earlier decisions. This opinion assumes familiarity with those preceding decisions.

The '485 Patent

Claim 1 of the '485 patent reads:

> Structure which comprises:
>
> a. a light sensing element comprising a first region of semiconductor material overlaid by a first electrode separated from said semiconductor material by insulation, said light sensing element being capable of containing a charge packet;

b. an adjacent region of said semiconductor material disposed for receiving said charge packet from said light sensing element;

c. means for controlling the transfer of said charge packet from said light sensing element to said adjacent regions; and,

d. charge sink means having a contact for applying a bias thereto buried within said semiconductor material and disposed for receiving excess charge accumulated in said light sensing element, said charge sink means extending laterally from said contact toward said light sensing element while beneath the surface of said semiconductor material.

This court interpreted the disputed portions of this claim language. *Loral*, 906 F.Supp. at 807-12. Summarizing this court's detailed claim construction, "charge sink means" describes a means-plus-function limitation. In accord with the specification, this court determined that the charge sink means is a region of semiconductor material doped opposite from its surrounding semiconductor material. The charge sink means does not include its associated depletion region. Thus, the charge sink means is a separate and distinct structure within the semiconductor substrate.

Claim 1 also provides a description of the location of this structure. The language identifies the "charge sink means" structure as "buried within said semi-conductor material." Further the claim places this structure "beneath

the surface of said semi-conductor material." The "buried within" and "beneath the surface" language means the charge sink structure is surrounded by and submerged within the semiconductor material.

This court construed "contact" to mean one or more electrical paths for charge to flow to and from the charge sink means. Lastly, this court interpreted the phrase "extending laterally from said contact toward the light sensing element" as conveying more information about the location of the charge sink structure. This directional language requires the charge sink structure to stretch from the contact toward the light sensing element. Thus, this buried structure extends parallel to the semiconductor's top surface and perpendicular from a contact toward the light sensing element. Figure 1 of the '485 patent provides an excellent depiction of the location of the charge sink structure.

During the course of the claim construction trial, the court heard extensive testimony about the reasons for a "buried" charge sink means. Semiconductor devices sense light with a structure that converts light waves into electrical charges. The light sensing element in the device, however, has a certain charge capacity. Intense light can cause the element to exceed its capacity causing excess charge to spill out of the light sensing structure and flow into adjacent light sensing elements. The result of this overflow is blooming — a spreading distortion of light on the detected image. To prevent blooming, the chip includes a structure to capture and dissipate excess charge from the light sensing elements. These charge capturing devices prevent the excess charge from spilling over into adjacent light sensing elements.

Initially, chip designers placed these charge drains next to the light sensing elements on the surface of the chips. *See* C.H. Sequin, *Blooming Suppression in Charge Coupled Area Imaging Devices,* The Bell System Technical Journal, October 1972; United States Patent 3,866,067. However, surface drains occupied valuable light sensing space on the surface of the chip. To achieve higher resolution in light detection, designers sought to remove charge drains from the chip surface leaving more room for light sensors. Early's '485 patent represents a step toward solving this problem by placing a drain structure below the surface of the chip to capture the excess charge below the light sensing element. [*See* Transcript of September 19, 1995, Hearing, at 32-33]. Consequently, the claims of the '485 patent cover a structure entirely beneath the surface of the chip.

After construing the claims, the court invited the parties to renew motions for summary judgment on the asserted claims of the '485 patent. The court granted Sony's motion for summary judgment of no literal infringement. However, the court denied the motion on the issue of infringement under the doctrine of equivalents. Additionally, the court granted Sony's motion for sanctions against Loral for discovery abuses. In its order, the court precluded Loral from deviating from its long-standing position that claims 7 and 8 describe only the operation of the structure in claim 1. *Loral,* 911 F.Supp. at 80. Under this ruling on the eve of trial, this court prevented Loral from asserting that claims 7 and 8 describe a "means" without many of the structural limitations in claim 1.

At trial the parties disputed whether Sony's accused CCD devices satisfied elements (a) and (d) of claim 1 of the '485

patent under the doctrine of equivalents. The parties also disputed whether Sony's devices infringed the method claims 7 and 8 in the '485 patent. The jury found that Loral had proven that Sony's devices infringed all of the asserted claims.

The '674 Patent

Loral asserts infringement of claim 1 of the '674 patent, which describes a process for making a self-aligned, gapless charge-coupled device (CCD). Claim 1 reads:

> 1. A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of
>
> > [1] selectively applying at least one layer of insulation material to said semiconductor substrate;
> >
> > [2] selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;
> >
> > [3] forming a first insulation layer over said plurality of first gate electrodes;
> >
> > [4] forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the

> edges of said implanted barrier regions being aligned with the vertical edges of the insulation layer on the respective first gate electrodes;
>
> [5] selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, each of said second gate electrodes substantially occupying the space between adjacent first gate electrode; and
>
> [6] connecting each of said second gate electrodes to and individual adjacent first gate electrode to form a composite electrode for a charge coupled element.

United States Patent 3,931,674 (bracketed numbers added to facilitate reference).

As with the '485 patent, this court construed the disputed portions of claim 1. *Loral,* 906 F.Supp. at 803-07. In particular, this court construed the claim to require formation of the insulation layer over the first gate electrodes before implantation of the barrier regions. In other words, the claim requires a process sequence with step three preceding step four. *Id.* at 806.

This court also invited the parties to renew motions for summary judgment on the '674 patent. On December 14,

1995, this court ruled that elements 1, 2, and 6 of claim 1 of the '674 patent read on Sony's processes.[1] On that same day, this court granted Sony's motion for summary judgment of no literal infringement of claim 1 because its processes all use a naked gate as a mask. In other words, Sony's process performs claimed step four before step three. However, this court denied all the motions for summary judgment on infringement under the doctrine of equivalents.

The case proceeded to trial on Loral's claim that Sony's processes infringe claim 1 of the '674 patent under the doctrine of equivalents. At trial, Loral called several witnesses to testify about the insubstantiality of the changes between the claimed invention and Sony's processes.

In addition to arguing that claim 1 is invalid, Sony contends its processes do not infringe claim 1 under the doctrine of equivalents. It, too, called several witnesses to testify about the substantiality of the differences between its processes and the claimed process. Sony alleges that reversal of steps 3 and 4 can cause the barrier region to extend a significant distance under the first gate electrodes in the resulting CCD structure. Sony presented evidence at trial

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1. This court recognized throughout the trial its obligation to consider the claim as a whole. *See Perkin-Elmer Corp. v. Westinghouse Elec. Corp,* 822 F.2d 1528, 1532-33 (Fed.Cir.1987); *Loctite Corp. v. Ultraseal Ltd.,* 781 F.2d 861, 870 (Fed.Cir.1985). By the same token, an accused process does not infringe if it lacks an element specified in the claim. *Charles Greiner & Co. v. Mari-Med Mfg., Inc.,* 962 F.2d 1031, 1036 (Fed.Cir.1992). Therefore, this court narrowed the issues for trial to those claim elements upon which the parties presented a genuine dispute about infringement.

that this undercutting phenomenon can cause "glitches" in a chip's operation. At the time of the patent, the use of an insulated gate as a mask, performing step 3 before 4, helped prevent undercutting. With the advance of technology in later years, Sony has developed others ways to prevent undercutting.[2]

Sony also alleges its processes do not satisfy the fifth limitation of the claim, which requires formation of the second gate electrodes between the first gate electrodes on the upper surface of the same continuous insulation layer with the first gate electrodes. At trial, Sony offered transmission electron micrographs (TEMs) to demonstrate that its processes do not form the second gate electrodes exactly on the same surface as the first gate electrodes. [STX 12, 13, 14, and 15]. In its case-in-chief, Loral relied on scanning electron micrographs (SEMs) to show substantial compliance with that claim limitation. According to Sony's expert, Mr. Denboer, however, SEMs do not sufficiently magnify the structure to reveal layer differentiation. [TR 2808-09].

In addition, Sony argues that prior art to the '674 patent describe its processes and thus limits application of the doctrine of equivalents. In particular, Sony argues work at Hughes Aircraft Company by Drs. Erb and Su, which culminated in a December 3, 1973, article, describes Sony's manufacturing processes. As such, Sony merely practices known prior art processes in the public domain to

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2. At trial, Sony showed use of trapezoidal electrodes and angled doping to prevent the barrier regions from spreading under the gates.

manufacture its accused CCDs. Sony called Drs. Erb and Su to testify about their work at Hughes during the relevant time period.

Prosecution History Estoppel

Beyond its arguments that the prior art limits the scope of the doctrine of equivalents and that its processes substantially differ from the claimed process, Sony argues the prosecution history prevents Loral from asserting infringement against Sony's processes and CCDs. The parties filed pretrial motions on the issue of prosecution history estoppel. This court denied Sony's motion and submitted the issue to the jury over the objection of both Loral and Sony. This court, however, advised the parties that it would treat the jury's verdict on this issue as advisory only. Indeed this court devoted significant time to resolution of the prosecution history estoppel issue in a separate hearing and argument several months after the jury trial.

Loral argues claim 1 of the '674 patent describes a process which implants barrier regions either before or after insulation of the first gate electrodes. Loral contends that the claim can cover a process which performs step four before step three. Sony contends Loral surrendered during prosecution any deviation from the process sequence.

The '485 patent also presents prosecution history estoppel questions. Sony argues that the prosecution process confined the '485 patent to a charge sink means buried within the substrate, not in contact with the surface, and extending laterally from the contact toward the light sensing element.

Loral claims the prosecution history does not preclude Loral from asserting a range of equivalents that would include Sony's substrate drain.

In this case, the trial record thoroughly examined the prosecution history of both the '674 and '485 patents. Beyond examination of the file wrapper, this court and the jury heard extensive inventor and expert testimony about the administrative acquisition of these patents. In its advisory capacity, the jury found that: (1) Sony did not prove by a preponderance of the evidence that Dr. Amelio surrendered or abandoned a 4-before-3 process sequence during acquisition of the '674 patent; and (2) Sony did not prove by a preponderance of the evidence that Dr. Early abandoned or surrendered a charge sink that covers Sony's substrate drain during the '485 prosecution history.

The Equitable Defenses

Finally, Sony contends the equitable defenses of laches and estoppel bar recovery by Loral in this case. Sony had claimed unenforceability for inequitable conduct but waived that defense before the trial on the equitable issues. The court heard testimony and received exhibits during the course of a two-day trial in April, 1996.

DISCUSSION

This Opinion will first address Sony's renewed motion for judgment as a matter of law. This analysis will include conclusions on prosecution history estoppel. The Opinion will then discuss this court's findings and conclusions on the equitable issues presented in the bench trial.

Appendix D

Sony filed a renewed motion for judgment as a matter of law under Fed.R.Civ.P. 50(b). Sony challenges the jury's verdict on the issues of ownership, infringement, and inducement to infringe. Curiously, Sony does not challenge the jury's verdict on validity.

A Rule 50 motion tests the sufficiency of evidence in support of a jury verdict. *Milbank, Tweed, Hadley & McCloy v. Boon,* 13 F.3d 537, 542 (2d Cir.1994); *accord Litton Sys., Inc. v. Honeywell, Inc.,* 87 F.3d 1559, 1566 (Fed.Cir.1996). In evaluating a Rule 50 motion, this court reviews the record to ascertain whether a reasonable jury could have reached the verdict in the case. *Milbank,* 13 F.3d at 542. Where substantial evidence supports its findings, this court must uphold the jury's verdict. *Goodwall Constr. Co. v. Beers Constr. Co.,* 991 F.2d 751, 754 (Fed.Cir.1993). Moreover, this court must view the evidence in the light most favorable to Loral, drawing reasonable inferences favorable to Loral, without determining credibility of witnesses, and without substituting its choice for that of the jury. *Wang Labs, Inc. v. Toshiba Corp.,* 993 F.2d 858, 863 (Fed.Cir.1993). In sum, this court must deny a renewed JMOL motion unless the movant shows that no reasonable jury could have reached its result. *Goodwall,* 991 F.2d at 754. In determining that no reasonable jury could have reached its result, the evidence must be "so overwhelming that reasonable and fair minded persons could only have reached the opposite result." *Sorlucco v. New York City Police Dep't,* 971 F.2d 864, 871 (2d Cir.1992) (quoting *Stubbs v. Dudley,* 849 F.2d 83, 85 (2d Cir.1988), *cert. denied,* 489 U.S. 1034, 109 S.Ct. 1095, 103 L.Ed.2d 230 (1989)).

With this lofty standard in mind, this court discerns substantial evidence in support of the jury's verdict on ownership. Loral called Steven Wahl, the general counsel involved in the asset transfers at issue, to testify about the various transfers of interests. Loral also offered the various agreements purporting to transfer the patents from company to company.

Based on the testimony and the document, a reasonable jury could have concluded that Loral Fairchild owned the patents in suit. Both inventors assigned the patents to Fairchild Camera & Instrument Corporation (FCIC). FCIC was renamed Fairchild Semiconductor Corporation (FSC). [TR 954-55, PTX 1037, PTX 41]. By written agreement and subsequent written assignment, FSC transferred title to the patents to Fairchild Weston Systems, Inc. (FWSI). Schedule A to those documents listed the patents. Loral Fairchild acquired the assets of FWSI. [TR 955-60, 1072-75, PTX 1037, PTX 41, PTX 70]. In 1989, FWSI separately assigned the patents to Loral Fairchild. [TR 960-61, PTX 1037, PTX 41].

Because neither party challenges the jury instructions, this court now turns to the core issue in this case — infringement of the asserted claims of the two patents under the doctrine of equivalents.

Sony's Motion for JMOL
on the '485 Patent

Sony moves for judgment as a matter of law that its accused devices do not infringe the '485 patent under the

doctrine of equivalents. The jury returned a verdict finding that Sony had infringed the asserted claims of the '485 patent under the doctrine of equivalents. Thus, the jury upheld Loral's position that Sony's Hole Accumulated Diode (HAD) sensor and substrate drain infringe elements (a) and (d) of claim 1 of the '485 patent.

However, no reasonable jury could find Sony's accused devices infringe any asserted claim of the '485 patent. Infringement of a claim requires, "without exception, that an accused device contain each limitation or its equivalent." *Athletic Alternatives, Inc. v. Prince Mfg., Inc.*, 73 F.3d 1573, 1582 (Fed.Cir.1996). The doctrine of equivalents grants no license to ignore claim limitations. *Dolly, Inc. v. Spalding & Evenflo Cos.*, 16 F.3d 394, 397 (Fed.Cir.1994); *accord Maxwell v. J. Baker, Inc.*, 86 F.3d 1098, 1105 (Fed.Cir.1996); *see Texas Instruments Inc. v. United States Int'l Trade Comm'n*, 988 F.2d 1165, 1171 (Fed.Cir.1993); *see also Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 1563 (Fed.Cir.1991) ("Our interpretation gives full effect to the recitation of two distinct elements in the claimed structure: linear border pieces and right angle corner border pieces."). Sony's devices do not contain a charge sink means as defined by the '485 claims.

Claim 1 of the '485 patent defines the charge sink means as a distinct structure of semiconductor material doped opposite from its surrounding semiconductor material. The claim also locates that structure within the semiconductor material. According to the claim, the charge sink means must extend parallel to the top surface of the semiconductor and perpendicular to a contact toward a light sensing element.

Sony's accused devices contain no such structure as a matter of law. *See Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 935 (Fed.Cir.1987) (en banc), *cert. denied*, 485 U.S. 961, 108 S.Ct. 1226, 99 L.Ed.2d 426 (1988); *Dolly*, 16 F.3d at 398.

In a Sony device, the entire substrate functions as a charge sink — a so-called substrate drain. Because Sony's charge sink structure is the entire substrate, it has no structure distinct from the surrounding substrate. Without this structure, nothing is doped opposite from the surrounding semiconductor material. Nothing is "buried within" the semiconductor material. Nothing extends from the contact toward the light sensing element beneath the surface of the semiconductor material. Moreover, Sony's substrate is in contact with a surface of the semiconductor (indeed it forms at least one surface) and thus cannot be "buried within" the semiconductor material. In sum, nothing meets element d of claim 1 of the '485 patent. Loral's effort to write this limitation out of the claim by way of the doctrine of equivalents violates the all elements rule.

Figure 1 of the '485 patent — relied upon extensively by both parties to describe element d of claim 1 — depicts well the charge sink defined by the claims. This figure shows an elliptical region (14) with an N+ doping, opposite from the surrounding P material (11, 12). This elliptical structure extends from the contact (16) toward the light sensing element (28a). The Sony accused devices have no such structure. Instead the substrate beneath the light sensor, represented by the P region (11, 12) in Figure 1 of the '485 patent, functions to remove excess charge from the light

sensing region and prevent blooming. While looking to Figure 1 to enlighten the meaning of the claim terms, this court recognizes that this drawing represents only one embodiment of the claims.

Attempting to identify a charge sink means within the Sony device, Loral arbitrarily draws an ellipse in a region of semiconductor material under the Sony light sensing element. This ellipse is not a distinct structure in a Sony device at all, but merely ink marks on a graphic representation of the Sony device. In the actual Sony devices, no distinct structure separate from the surrounding semiconductor material exists at the location Loral highlights. Thus, the Sony device lacks a vital limitation in claim 1 of the '485 patent. Because Sony does not make, use, or sell the structure in claim 1, it also cannot infringe claims 7 and 8. These claims describe only methods of operating the structure in claim 1.

In addition, this court concludes that the '485 prosecution history estops Loral from asserting that Sony's substrate drain satisfies element d of claim 1 under the doctrine of equivalents. Claim 1 of the '485 defines the "charge sink" structure as disposed in a specifically defined location. The inventor added these limitations defining the charge sink structure and its location in response to examiner rejections in light of prior art. *Loral,* 906 F.Supp. at 811.

When first filed, element (d) of the application claim read:

> charge sink means buried within said semiconductor material and disposed in proximity

> to said light sensing element for receiving excess charge accumulated in said light sensing element.

[STX 504 at E18]. The examiner objected to this language because it did not recite the location of the charge sink region other than within the semiconductor material and close to the light sensor. This description read on the prior art which included semiconductors with charge sinks located on the top surface of the device. [STX 504 at E24].

In response to the rejection, Loral amended element d to read:

> charge sink means buried within said semiconductor material and disposed for receiving excess charge accumulated in said light sensing element, said charge sink means being located beneath and not in contact with the surface of said semiconductor material.

[STX 504 at E29]. In another amendment Loral amended element d to read:

> charge sink means buried within said semiconductor material and disposed for receiving excess charge accumulated in said light sensing element, said charge sink means extending laterally toward said light sensing element while beneath the surface of said semiconductor [sic] material.

[STX 504 at E35]. The examiner required further structural definition of the location of the charge sink structure before

allowing the claims to issue in the '485 patent. In particular, the examiner required the claim to specify a "contact" and to define the spatial orientation of the charge sink structure in relation to the contact. [STX 504 at E40]. These additional requirements from the examiner came in a telephone conference with Loral's attorney. [*Id.*] Loral's attorney agreed to these amendments to secure issuance of the '485.

To overcome an examiner's rejection based on prior art, Loral changed the scope of its claim. *See Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1219 (Fed.Cir.1995). This court finds that Loral narrowed its claims to avoid rejections based on prior art and to obtain the '485 patent. Thus, Loral relinquished during prosecution a range of equivalents which might embrace more than the specific structure described in the claim language. In other words, a charge sink only infringes if it is a separate structure buried within the substrate, extending laterally from a contact toward the light sensor, and avoiding all contact with the surface. Loral cannot recapture under the doctrine of equivalents claim scope which might encompass the Sony device.

In addition to the missing charge sink structure, Sony's semiconductors also contain no distinct contact structure. In its claim interpretation opinion, this court defined the term "contact" as an electrical path or paths. *Loral*, 906 F.Supp. at 811-12. Within the meaning of the claims, the term "contact" describes a path formed by conductive structure extending from a surface of the semiconductor to make ohmic contact with the charge sink structure. As the language of the claim indicates, this structure's perpendicular extension to a surface of the semiconductor provides a reference point

for the lateral extension of the charge sink structure toward the light sensor.

As with the charge sink means itself, Loral attempts to manufacture a contact structure in the Sony device by drawing potential contact lines from the imaginary charge sink ellipse on a diagram of a Sony device. As aptly noted by Sony counsel at oral argument on this motion, Loral's attempt to create structure in Sony's substrate resembles the argument that a chair exists in a block of metal because one can draw the outline of the chair on one face of the block. Loral then draws an infinite number of contacts running downward from the imaginary ellipse toward the bottom of the substrate. These imaginary lines are not contact structures as defined by the '485 claims. The '485 claims require a defined electrical structure to reach from a surface to the charge sink structure. This electrical structure in the claims also serves to define the location of the charge sink, which stretches from that structure toward the light sensor. No such electrical structures exist in the Sony device. The Sony device uses the entire substrate as both the charge sink and the contact. Once again, the Sony device simply does not include the "contact" structure limitation in the '485 claims.

In sum, the accused Sony devices contain no distinct charge sink or contact structures in their substrate drain. The substrate of the Sony device is simply not a charge sink structure nor a contact structure as defined in the claims. These limitations missing from the Sony devices prevent infringement under the doctrine of equivalents as a matter of law. *Dolly,* 16 F.3d at 400; *Maxwell,* 86 F.3d at 1105. Consequently, this court will grant Sony's motion for

judgment as a matter of law of noninfringement of the asserted claims of the '485 patent.

Although the absence of a charge sink means alone precludes infringement, this court also addresses Sony's HAD sensor and element a of claim 1. Claim 1 of the '485 patent requires a "light sensing element." The claim further describes this element as a MOS (metal-oxide-semiconductor) structure "capable of containing a charge packet." The claim describes the MOS structure in specific terms: "a first region of semiconductor material overlaid by a first electrode separated from said semiconductor material by insulation." An external voltage or potential enables the MOS structure to contain a charge packet.

In a Sony device, the light sensing element is not a MOS structure. Instead the Sony CCDs have a photodiode sensor. This type of sensor, called a HAD sensor, is a hole accumulation layer within the semiconductor material. Nothing in the Sony device is an electrode separated from the top of the semiconductor material by insulation. The HAD sensor lacks an electrode and lies within the semiconductor material, not on top. Moreover, nothing in the Sony sensor requires the application of an external voltage to contain a charge packet.

As with the charge sink means structure, no light sensor structure in the Sony device corresponds to the MOS structure on top of the semiconductor material — specific requirements of the '485 claims. "[E]quivalency cannot embrace a structure that is specifically excluded from the scope of the claims." *Dolly,* 16 F.3d at 400. Therefore, as a

matter of law, the Sony devices do not satisfy element a of claim 1 under the doctrine of equivalents.

Beyond the problem of a missing structural claim element, no reasonable jury could apply the doctrine of equivalents to find that the HAD sensor satisfies the light sensor requirement of the '485 patent. In the first place, as mentioned, the structure of the HAD sensor varies substantially from the claimed structure. In addition, these structural differences cause the HAD sensor to work in a different way to reach a different result. The HAD sensor works in a different way because it requires no external bias. It also achieves a different result because without an electrode to block some light, the Sony sensor is more sensitive to blue frequencies of light.

To show infringement by equivalents, Loral produced, among other evidence, statements from Sony that its HAD sensor works as a "virtual gate." [PTX 98, TR 3795]. In the circumstances of this case, Sony's rhetoric, designed to draw broad analogies to reliable MOS technology, has no legal significance. Sony's rhetoric does not admit that the HAD sensor possesses the structure required by the claims of the '485 patent. Moreover, in the face of the overwhelming evidence of the structure of Sony's HAD sensor, this rhetoric cannot substitute for the undisputable evidence of the structure of Sony's HAD sensor and the requirements of claim 1 of the '485 patent. Therefore, this evidence does not alter the legal conclusion that the light sensor defined in claim 1 of the '485 patent cannot have an equivalent in the Sony CCDs.

Appendix D

In conclusion, primarily because Sony's devices clearly and unequivocally lack a charge sink structure, this court grants Sony's motion on that sufficient ground. That single, vital missing claim limitation precludes infringement by equivalents as a matter of law. In addition, this court concludes, based on similar reasoning, that Sony's devices lack a contact structure and a light sensor structure as defined in the claims. As a matter of law, the '485 patent has no equivalent in the Sony CCD devices. Because the court previously ruled that all the asserted claims of the '485 patent rise or fall with infringement of claim 1, no reasonable jury could find infringement of any of the asserted claims of the '485 patent.

Sony's Motion for JMOL
on the '674 Patent

The jury returned a verdict finding that Sony had infringed claim 1 of the '674 patent under the doctrine of equivalents. The jury also reported that Sony did not prove prosecution history estoppel and that Loral was not asserting infringement of a process covered by the prior art.

The issue of infringement of claim 1 of the '674 patent turns entirely on the prior art status of a December 2, 1973 article by Dr. Darrel Erb and the work leading up to that article. The jury found in a special verdict that neither the article nor the antecedent work was in the prior art. Without the article or the work in the prior art, substantial evidence supports the jury's verdict of infringement under the doctrine of equivalents. However, if the Erb article or the preceding work is prior art to the '674 patent, no reasonable jury could find infringement of claim 1 of the '674 patent.

Appendix D

Several facts are not in dispute. Dr. Gilbert Amelio filed the '674 patent on February 8, 1974. Dr. Erb published his article more than two months earlier in the International Electron Devices Meeting Technical Digest.

The Erb Article recites the following process:

> The lightly doped p layer is formed by implanting boron or by epitaxy. After regrowing the gate oxide, a layer of silicon nitride is deposited. This is followed by the deposition and etch of the polycrystalline silicon storage electrodes. To make the device operate as a two phase CCD the wafer is then implanted with an n-type impurity to partially compensate the p-type layer in the areas which are not masked by the silicon gate electrodes. The device is then oxidized to form the insulator over the polycrytalline silicon electrodes. The nitride, which is exposed in the interelectrode gaps, resists oxidation and does not get thicker. Finally, a layer of aluminum is deposited and etched giving the transfer electrodes.

[STX 322]. This passage recites the process in claim 1 of the '674 patent, with the exception of a reversal of steps 3 and 4 of the claimed process. In addition to this close recitation of the process claimed in the '674 patent, the Erb article included six figures showing a cross section of the CCD device produced by the Erb method and some oscilloscope readings from the Erb CCD in operation.

Appendix D

Overwhelming evidence showed conclusively that the Erb article describes or, at least, renders obvious Sony's accused processes. With the Erb article in the prior art, no reasonable jury could find that Sony infringes claim 1 of the '674 patent.

On its face the document discloses a process for making a two-phase, buried channel CCD shift register using a naked gate as a mask. Testimony at trial showed conclusively that the document describes the significant process steps used to make the Sony process and would thus at a minimum render obvious the Sony processes. [TR 2341-44, 2608, 3160, 3214]. As explained by Dr. Robert Bower, Sony's expert witness, by process step numbers, the Erb article describes a process sequence of 1, 2, 4, 3, 5, and 6. [TR 3160]. Sony's processes follow that very same sequence. [TR 3160-61]. Moreover, one of ordinary skill in the art using the Erb article would know how to use the process to make CCDs. Thus, the article describes the significant process steps used to make Sony's CCD devices.

Loral attempts to argue that the Erb article is nonenabling and therefore ineffective as prior art for purposes of the doctrine of equivalents. A non-enabling document, however, still qualifies as prior art for obviousness purposes. *Symbol Technologies, Inc. v. Opticon, Inc.*, 935 F.2d 1569, 1578 (Fed.Cir.1991).

As such, under the Federal Circuit's decision in *Wilson Sporting Goods Co. v. David Geoffrey & Assoc.*, 904 F.2d 677, 683-85 (Fed.Cir.), *cert. denied*, 498 U.S. 992, 111 S.Ct. 537, 112 L.Ed.2d 547 (1990), the Erb article would (if it is

prior art), as a matter of law, bar Loral's claim of infringement of the '674 patent against Sony's processes. *See Conroy v. Reebok Int'l, Ltd.*, 14 F.3d 1570, 1576 (Fed.Cir.1994). Loral may not assert a range of equivalents which embraces prior art. Because Sony's process replicates the steps of the Erb article, Loral could not assert the doctrine of equivalents to cover the Sony process because that accused process antedated the claims. Consequently, with Erb in the prior art no reasonable jury could find infringement of claim 1 of the '674 patent by equivalents. *See E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1436-37 (Fed.Cir.), *cert. denied*, 488 U.S. 986, 109 S.Ct. 542, 102 L.Ed.2d 572 (1988).

Interestingly, Loral also argues that because the Erb article describes mainly structure, it would not render obvious a process to make that structure. This argument, however, runs counter to Loral's position on inducement to infringe. In support of the jury's verdict of inducement of claim 1 of the '674 patent, Loral strenuously urges that Sony reverse engineered or copied a Loral chip. That copying, Loral argues, supports the jury's verdict that Sony induced infringement of claim 1 of the '674 patent, which describes a process to make a CCD. Thus, Loral's inducement argument admits that one may determine the process used to make a chip by looking at the resulting structure. Moreover, testimony from both sides clearly indicated that the structure of a chip may reveal the significant process steps used to make that chip. [*See* TR 1380-83, 2350].

Appendix D

Erb Article as Prior Art — Section 102(a)

The issue then becomes whether the Erb article or the work at Hughes culminating in the Erb article constitutes prior art for application of the doctrine of equivalents. As a publication, 35 U.S.C. § 102(a) (1994) makes the Erb article prior art for assessing infringement under the doctrine of equivalents. As the patentee, Loral bears the burden of persuasion on all issues relating to infringement under the doctrine of equivalents. At trial, Loral sought to show that Amelio invented the subject matter of the '674 patent before publication of the Erb article. Thus, the critical date which Loral must antedate is December 3, 1973.

As recently clarified by the Federal Circuit, Loral's attempt to antedate a publication must satisfy priority rules encountered primarily in the interference context. *Mahurkar v. C.R. Bard, Inc.*, 79 F.3d 1572, 1576-77 (Fed.Cir.1996). In *Mahurkar*, the Federal Circuit stated the proof required to antedate a reference. An inventor may gain priority by showing that he reduced the invention to practice before the publication date of the reference. *Id.* at 1577. Alternatively, the inventor may gain priority by showing his conception of the invention before publication of the reference, coupled with reasonable diligence from a date before publication to reduction to practice. *Id.* at 1577-78. Here, the patentee, Loral, bears the burden of persuasion on the status of the Erb article and the Erb/Su work as prior art by a preponderance of the evidence. *Wilson*, 904 F.2d at 685.

The initial priority inquiry is reduction to practice. To show actual reduction to practice, an inventor must

demonstrate that the invention works for its intended purpose. *Scott v. Finney*, 34 F.3d 1058, 1061 (Fed.Cir.1994). Depending on the invention and the problem it solves, test results may be necessary to show the invention worked for its intended purpose. *Mahurkar*, 79 F.3d at 1578. As noted by *Scott* and *Mahurkar*, actual reduction to practice for a complex invention such as the CCD process in this case requires test results that demonstrate the processes will work for their intended purpose. *Scott*, 34 F.3d at 1062, *Mahurkar*, 79 F.3d at 1578; *Koval v. Bodenschatz*, 463 F.2d 442, 447 (CCPA 1972) ("[T]here must be a functional relationship between the test conditions and the intended functional setting."); *see also Holmwood v. Sugavanam*, 948 F.2d 1236, 1238-40 (Fed.Cir.1991); *DSL Dynamic Sciences Ltd. v. Union Switch & Signal, Inc.*, 928 F.2d 1122, 1125 (Fed.Cir.1991); *Elmore v. Schmitt*, 278 F.2d 510, 513 (CCPA 1960).

Loral contends Dr. Amelio reduced to practice the process claimed in the '674 patent at least as early as September 1973. Loral points to a mask overlay set, a run sheet, and testimony from Dr. David Wen as evidence of actual reduction to practice. Dr. Wen explained that the mask overlays were a set of transparencies or stencils used to "define the actual features that you will put on a piece of silicon to manufacture . . . a CCD device." [TR 1747]. Each sheet or transparency corresponds to a different process step. [TR 1748]. He explained that the particular set of transparencies, dated September 14, 1973, corresponded to a linear array which "*basically* follows the Amelio process." *Id.* (emphasis added). According to Dr. Wen, these stencils suggest Fairchild had completed the design of the device and were about to begin manufacturing. [TR 1749].

Appendix D

Dr. Wen explained that the run sheets identify specific process steps to make a CCD. [TR 1750-53]. The particular run sheets offered by Loral had several months identified on them. However, none of the sheets identified the year. Dr. Wen believed they were generated in the "1974 time frame." [TR 1751]. He based this belief on the fact that one particular document "describes a process sequence for one of the experiments that . . . was run at that time. This particular experiment is to produce some surface channel CCD devices." [TR 1751]. Apparently, Dr. Wen ran some experiments in March 1975 on a CCD produced in late 1974. [TR 1752-53].

This evidence does not corroborate Loral's allegation that Dr. Amelio had reduced his invention to practice by September 1973. At best, as recognized by Dr. Wen, the mask overlay set demonstrates Fairchild researchers had performed some design work. The overlays do not show that Dr. Amelio had run the process claimed in the '674 patent and knew it would work for its intended purpose.

The run sheets show nothing about activities occurring at Fairchild in September 1973. As Dr. Wen testified, the run sheets detail process steps performed "in the 1974 time frame" — too late to antedate Dr. Erb's activities. Moreover, Dr. Wen explained that the run sheets refer to experiments with a surface channel CCD. [TR 1752]. The process claimed in the '674 patent, however, relates to production of a buried channel CCD. Consequently, the run sheets bear no clear connection to the mask overlay set. Even if the run sheets depict performance of the process steps in the mask overlay set, Fairchild did not run the process steps until 1974. Dr.

Amelio could not have known the process would work for its intended purpose until after he ran the process and tested CCDs produced by that process. In simple terms, the mask overlay set and run sheets do not supply enough evidence to permit a reasonable jury to find actual reduction to practice as early as September 1973.

In an effort to bolster its case, Loral also notes that on September 18, 1973, Dr. Kim, a Fairchild researcher, gave a presentation at a conference in San Diego, California at which he discussed the process claimed in the '674 patent. [PTX 1057]. Again, however, nothing in the record about this speech suggests Dr. Amelio had run the process and had tested CCDs produced from that process. In sum, Dr. Kim's speech does not prove that Dr. Amelio knew the process would work for its intended purpose.

Loral also points to a proposal submitted by Fairchild to the United States Air Force in November 1973. Fairchild sought funding from the government to develop a CCD device for the Government. [TR 1764]. Fairchild indicates in the proposal that it would use its isoplanar gapless buried channel technology. Fairchild also represents to the Air Force that as of November 1973, "Fairchild's Isoplanar gapless buried channel technology . . . is already showing reliable performance and high yield." [TR1758-59, 1763-65, PTX 16 at § 4, p. 4-5]. According to Dr. Wen, that process is the same as the process claimed in the '674 patent. [TR 1764]. The proposal goes on to discuss transfer efficiency, a key parameter in CCD devices. [PTX 16 at § 4, p. 20]. Again, Fairchild represents to the Air Force that it has solved the transfer efficiency problem encountered with surface channel

technology through the use of its buried channel technology. [*Id.*].

The Air Force proposal contains only conclusory statements about yield and performance of a process to make LARAM devices. No process steps, no data, no test parameters, no test results, and no dates appear in the proposal. Moreover, nothing in the proposal suggests Dr. Amelio ran tests in September 1973. The conclusory statements in the Air Force proposal do not corroborate that Dr. Amelio had run the process and had tested the CCDs produced by the process. In sum, the Fairchild proposal does not show, with the degree of specificity required for reduction to practice in a priority contest, that Dr. Amelio knew that the process would work for its intended purpose.

Loral also points to a newspaper article and data sheet regarding the CCD 110, a 256 element linear CCD device. [PTX 127 and 128]. The March 1974 data sheets describe the characteristics of a recently developed device for potential customers. [TR 1766]. According to Dr. Wen, Fairchild would have needed two months of testing on a working device to generate the information in the data sheets. [TR 1767]. Fairchild then announced availability in a publication of the 256 element linear array. [PTX 128, TR 1768-69]. Again, this information does not corroborate any testing from September 1973 that would permit the trier of fact to find reduction to practice at that time.

In sum, Loral does not present sufficient evidence of actual reduction to practice before September 1973. Although presenting circumstantial evidence of activities at Fairchild,

none of this evidence shows that Dr. Amelio had actually tested a CCD device made by the claimed process to verify its workability. Loral's evidence lacks specifics about test results or about time frame or about the types of processes producing the CCDs. When measuring reduction to practice in a priority contest, this specific evidence is critical. *Naber v. Cricchi,* 567 F.2d 382, 386 (CCPA 1977) (explaining that evidence must show "specific acts at specific times directed at reduction to practice"), *cert. denied,* 439 U.S. 826, 99 S.Ct. 98, 58 L.Ed.2d 119 (1978); *Litchfield v. Eigen,* 535 F.2d 72, 76-77 (CCPA 1976); *National Tractor Pullers Ass'n v. Watkins,* 205 USPQ 892, 912 (N.D.Ill.1980). Without these specifics, Loral does not supply enough evidence to support a showing of actual reduction to practice before September 1973.

Without evidence of an actual reduction to practice, Loral can rely upon the alternative course of conception and diligence to antedate the Erb reference. Conception requires that an inventor have formed in his or her mind a definite and permanent idea of the complete and operative invention. *Burroughs Wellcome Co. v. Barr Labs., Inc.,* 40 F.3d 1223, 1228 (Fed.Cir.1994), *cert. denied,* __ U.S. __, 116 S.Ct. 771, 133 L.Ed.2d 724 (1996). The idea must be so clearly defined in the inventor's mind that only ordinary skill, without extensive research or experimentation, would be necessary to reduce the invention to practice. *Id.*

According to Loral, Amelio conceived of the subject matter of the '674 patent no later than July 1973. Loral presents no contemporary evidence of conception directly from Dr. Amelio, but instead supplies entries in another

researcher's laboratory notebook and a memorandum written by that same Fairchild researcher to Dr. Amelio. First, Loral cites the laboratory notebook with Dr. Pao's signature and a date of July 3, 1973. [PTX 15]. Dr. Pao worked at Fairchild Camera and Instrument Corporation during the relevant period under Dr. Amelio.

On the excerpted pages, Dr. Pao lists twenty-two process steps, which include those claimed in the '674 patent. Dr. Pao also states that implantation of the barrier regions may be performed either before or after oxidation of the first gate electrodes. After listing the process steps, Dr. Pao depicts a CCD that would result from performance of the listed process.

Loral also points to a memorandum from Dr. Pao to Dr. Amelio dated July 13, 1973. In that memorandum, Dr. Pao proposes a process to make a particular device using the process claimed in the '674 patent. [PTX 17]. Loral offered Dr. Amelio's deposition testimony during the course of trial. In his deposition for this case, Dr. Amelio testified that the process sequence described in the Pao notebook was the same as his process. [TR 1660]. He further testified that he conceived of implanting the barrier regions either before or after oxidation at the time of the entries in Dr. Pao's notebook. [TR 1662]. According to Dr. Amelio, Fairchild experimented with both techniques in the 1971-75 time frame. [TR 1662].

Finally, Loral cites an entry in Dr. Choong-Ki Kim's notebook dated October 5, 1973. [PTX 129]. After describing a problem encountered by Fairchild, Dr. Kim states: "A

solution to this problem was invented by Gilbert F. Amelio." He then lists a series of process steps, which include those claimed in the '674 patent.

This evidence provides substantial support for a finding that Amelio conceived of the subject matter of the '674 patent at least as early as July 1973. While Loral does not supply documentary evidence from Amelio, the circumstantial evidence repeatedly refers to the inventor and repeats his invention, thus corroborating that Dr. Amelio was in possession of the process steps in his claimed invention in July 1973. For instance, Dr. Pao recites Dr. Amelio's process in July 1973. Dr. Kim's notebook entry a few months later identifies the process as Amelio's. A jury could reasonably find from this evidence that Amelio conceived the subject matter of the '674 patent at least as early as that time period.

Although Loral can supply evidence to support conception before publication of the Erb article, that showing is only a part of the equation. Loral must also show reasonable diligence from a time just before publication of the Erb article through the filing date of the patent. *See Griffith v. Kanamaru,* 816 F.2d 624, 625-26 (Fed.Cir.1987). An inventor must provide specific details on activity during the critical period. General testimony that the inventor worked continuously and diligently will not suffice. Moreover, the inventor must corroborate evidence of reasonable diligence. *Gould v. Schawlow,* 363 F.2d 908, 919 (CCPA 1966).

Once again, Loral offers no reliable evidence at all — let alone documentary evidence during the relevant period

— from Dr. Amelio himself about his diligence. Instead, to show Amelio's reasonable diligence from late 1973 through the filing date of the patent, Loral points to the March 1974 data sheet and the March 1974 newspaper article announcing the availability of commercial CCDs made by the Amelio process. This evidence is insufficient as a matter of law. Neither the article nor the data sheet detail any activity during the critical period. While Dr. Wen explained that the data sheet could not have been prepared without several months of reliable testing, such generalized statements do not satisfy the stringent diligence requirements. *Naber,* 567 F.2d at 386, *Gould,* 363 F.2d at 919; *Ireland v. Smith,* 97 F.2d 95, 100 (CCPA 1938) ("We may surmise that appellant was probably diligent . . . but mere surmise cannot take the place of proof."). At no point does Loral present signed laboratory notebooks from Dr. Amelio describing his continual, uninterrupted diligence. At no point does Loral present a series of test results or activities showing continual, uninterrupted diligence. At no point does Loral present Dr. Amelio to testify of his diligence, which would still, of course, require further corroboration. *Gould,* 363 F.2d at 919-20; *accord Holmwood,* 948 F.2d at 1239. In fact, other than Dr. Wen's testimony about what must have been occurring, Loral presents absolutely no evidence at all of any activities occurring at Fairchild between the publication date of the Erb article and the filing date of the '674 patent.

In sum, based on Loral's evidence, no reasonable jury could find Amelio proceeded with reasonable diligence from late 1973 to his reduction to practice. To antedate the Erb reference, Loral would need to show Amelio's diligence from before Erb's publication until his constructive reduction to

practice upon filing his patent application. Without evidence of diligence following publication, Dr. Amelio cannot antedate Dr. Erb's article. *In re Mulder,* 716 F.2d 1542, 1544-45 (Fed.Cir.1983).

While presenting its story about development of the process claimed in the '674 patent, Loral suffers from a lack of evidence to support that story. The law on priority regards oral testimony with great skepticism. *Mahurkar,* 79 F.3d at 1577 (collecting cases). For that reason, a party asserting priority must supply corroborating evidence. *Id.* More than twenty years have passed since the events of invention and patent filing. No doubt many documents that would support Loral's story have been lost. Without that critical evidence, however, the law leaves the parties with the filing date of the '674 patent and the publication date of the Erb article. Consequently, this court concludes the Erb article is prior art as a matter of law for purposes of determining infringement under the doctrine of equivalents.

This court reaches this conclusion despite the brief period for which Dr. Amelio must show diligence. Dr. Erb published his article on December 1973. Dr. Amelio filed his patent application on February 8, 1974. Although Loral presents its story that Dr. Amelio must have been busy during that brief period, the law requires more than a story; it requires relevant evidence with corroboration. In the absence of that evidence, this court must conclude that the law prevents Dr. Amelio from showing reasonable diligence from before Dr. Erb's publication until constructive reduction to practice.

Appendix D

Erb/Su Work as Prior Art — Section 102(g)

As noted above, because Dr. Amelio cannot antedate Dr. Erb's December 1973 publication, the Erb article stands as prior art under section 102(a) and precludes infringement as a matter of law. In the alternative, however, his court also finds no reasonable jury could conclude the Erb/Su work is not prior art to the '674 patent for assessing infringement under the doctrine of equivalents. The work of Drs. Erb and Su culminating in the December 1973 article qualifies as prior art under 35 U.S.C. § 102(g) (1994). This work antedates Dr. Amelio's inventive activities.

Drs. Erb and Su had conceived of the process described in claim 1 of the '674 patent by November 7, 1972, and reduced it to practice no later than August 1973. Moreover, their publication of that work in December 1973 obviates any credible claim of abandonment, suppression, or concealment. As such, the Erb/Su work qualifies as prior art under section 102(g).

Applying the reduction to practice rules noted above, Sony states that Erb and Su reduced their idea to practice no later than August 1973. Dr. Erb testified that the conference which published his paper would only accept articles reflecting successful experiments on a working device. Indeed the Erb article includes three oscilloscope printouts, which show output from a working CCD produced with the process described in the paper (with implantation of the barrier regions before insulation of the first gate electrodes). An entry from Dr. Erb's notebook indicated a September 20 deadline for submission of conference papers. To meet the

September 20 deadline, Drs. Erb and Su testified that they would have completed the successful tests on the working device in August 1973. Sony presented no further evidence for its August 1973 reduction to practice.

Sony presented no documentary evidence from the July to August 1973 time period to corroborate its August 1973 actual reduction to practice. As explained above, priority rules require corroboration of an actual reduction to practice. *Hahn v. Wong,* 892 F.2d 1028, 1032-33 (Fed.Cir.1989); *see Gortatowsky v. Anwar,* 442 F.2d 970, 972 (CCPA 1971). Other than Erb and Su, the "inventors," no one testified regarding events at Hughes during July and August 1973. At most, their testimony works backward from the December 1973 article to suggest that inventive activity must have been underway in July and August. This type of evidence is insufficient as a matter of law. Dr. Erb conceded that no notebook entries reflect work on a CCD in that time frame. [TR 2752].

For its part, Loral contends Erb and Su finalized their work on the December article only after Erb heard Dr. Kim's presentation at the San Diego conference.[3] As acknowledged

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3. Loral attempts to argue that Dr. Erb derived the process and structure described in his article from Dr. Kim's presentation in San Diego. To the contrary, Dr. Kim also cites Dr. Erb's article (which includes Dr. Su as a co-author) as a reference in one of his own later publications. Thus, Dr. Kim apparently credited Dr. Erb with independent work. [STX 595]. More important, as noted hereafter, Dr. Su's notebook shows an earlier conception date than Amelio's or Kim's. Consequently, no reasonable jury could conclude Dr. Erb derived the process and device described in the December article from Dr. Kim.

by Dr. Erb, his notebooks contain his sketchy notes of Dr. Kim's lecture at the San Diego conference. [PTX 1057]. After returning from this conference, Dr. Erb calculated a way to implant phosphorous — a calculation necessary to design the CCD structure in the December 1973 paper. In addition, Dr. Erb cites Dr. Kim's San Diego paper as a reference in the back of his own December paper. [TR 2753-54]. This evidence supports Loral's position that Erb completed his article in a grace period after the September conference. Moreover, as Loral showed, before the San Diego conference Dr. Erb primarily worked with four-phase CCD devices. [PTX 709, TR 3890-91].

Drawing all inferences in Loral's favor, this court concludes that no reasonable jury could find that Erb and Su actually reduced to practice the process described in the December paper as early as August 1973. At the same time, Loral concedes Dr. Erb must have mailed the article to the conference within two to three weeks of the San Diego conference. Therefore, before that point, Drs. Erb and Su must have tested the working device because the article includes those test results in the form of the oscilloscope readings. These test results show an actual reduction to practice. Thus, Drs. Erb and Su must have reduced to practice the process described in the paper by the end of September 1973. The data in Dr. Erb's notebook immediately following the San Diego conference supports this date for actual reduction to practice. [PTX 703].

In any event, the record shows that Drs. Erb and Su actually reduced their process to practice at the end of September 1973. This process, except for reversal of process

steps 3 and 4, replicates the process claimed in the '674 patent. Drs. Erb and Su described implantation of the barrier regions before insulating the first gate electrodes. Their September 1973 reduction to practice antedates Dr. Amelio's constructive reduction to practice in February 1974. Because Dr. Amelio cannot show reasonable diligence from before this date to his filing date, the Erb/Su work stands as prior art. Moreover, as this court will now examine, Drs. Erb and Su can show a conception which antedates Dr. Amelio's failed attempts to prove conception and diligence.

Applying the same conception rules recited above, Sony argues Dr. Steven Su (a listed co-author of the Erb article) conceived of the idea described in the December 1973 article on November 7, 1972. Unlike the dearth of evidence from Dr. Amelio, Dr. Su testified at trial and produced a remarkably detailed, contemporary laboratory notebook showing a buried channel device. [PTX 705 at 91-93]. Extensive testimony at trial verified that one of skill could deduce the process of manufacture from the CCD cross sections and other information in Dr. Su's notebook.[4]

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4. As noted, any suggestion that the structure of a CCD does not reveal the process by which that CCD was made conflicts with Loral's arguments that Sony learned the '674 process, at least in part, by cutting open or reverse engineering a Fairchild CCD. Moreover, the depiction of structure in Dr. Su's notebook clearly shows alignment of the barrier regions with the first gate electrodes just as the diagrams in the '674 patent depict alignment with the first insulation layer over the first gate electrodes. Although witnesses agreed a structure could be made different ways, that observation does not refute a diagram's ability to disclose the process for making the disclosed structure. That is, a diagram may convey

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Appendix D

Loral challenged the timing of the November 1972 entry with an allegation that Su added key information to the November 7 entry at a later date. This charge came from Loral's expert, Ms. Manoliu, who offered her opinion that entries in a different color of ink showed that Dr. Su must have doctored his notebook. [TR 3883]. Dr. Su, however, categorically denied adding the information at a later date. [TR 2584, 2594-95]. Indeed, corroborating that testimony, the notebook shows that Dr. Su consistently used different colors of ink throughout his well-organized and tidy notebook. Moreover, Loral contends that the alleged doctoring attempts to hide that Dr. Su only conceived of a stepped oxide semiconductor device. To the contrary, the companion drawing in Dr. Su's notebook shows the first and second gate electrodes on the same surface, which verifies Dr. Su's understanding of the same surface concept. [PTX 705].

In addition, Dr. Erb's notebook contains a November 14, 1972 entry expressly recognizing Dr. Su's work with buried channel technology. [PTX 700 at 87]. This entry in Dr. Erb's notebook adds support to the timing of Dr. Su's November entry. The weight and veracity of the notebook evidence, even accounting for the sole opinion about doctoring, would compel a reasonable jury to find that Dr. Su conceived the Erb/Su invention no later than November

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to one of ordinary skill in the art many processes that could be used to make that device. The skilled artisan may not be able to pinpoint the precise method used to make that device. Nevertheless, the diagram would still disclose all of the methods understood by the person of skill in the art.

1972. Thus, as a matter of law, Drs. Erb and Su conceived their invention before Dr. Amelio.

Because Drs. Erb and Su were both first to conceive and first to reduce to practice their invention, their work is prior art for application of the doctrine of equivalents to Sony devices. *See Steinberg v. Seitz*, 517 F.2d 1359, 1364 (CCPA 1975) (noting that diligence is only relevant where the first to conceive is also the second to reduce to practice). Thus, no reasonable jury could find that the Erb/Su work was not prior art. Finally, as noted earlier, publication of the paper precludes any finding that Erb and Su abandoned, suppressed, or concealed their work.

In summary, the record shows that Erb and Su conceived of their invention in November 1972. They then proceeded to reduce it to practice in late September 1973. Because the most favorable view of the evidence sets Dr. Amelio's conception in July 1973 and his reduction to practice (constructive) in February 1974, the Erb/Su work qualifies as prior art. With the Erb/Su work as prior art, no reasonable jury could find infringement under the doctrine of equivalents. The record shows that Sony practiced the process disclosed in the Erb prior art, namely implantation of barrier regions before insulation of the first gate electrodes. Because the doctrine of equivalents cannot extend exclusive patent rights to encompass art already in the public domain, *Wilson*, 904 F.2d at 683-84, the law will not permit a jury to find that Sony infringed the '674 patent by using the Erb process.

Putting aside the issue of sufficiency of the evidence, the jury made a finding that the Erb article was not prior art.

Appendix D

The closing argument may help explain why the jury made a finding contrary to the law. During closing argument, Loral argued that Dr. Erb had abandoned his inventive work. Although the court barred Loral's witness, Mr. Cecil Quillen, from testifying to the issue of abandonment, Loral's counsel during his reply closing argument argued strenuously that Hughes and Dr. Erb had abandoned the work published in Dr. Erb's paper. Counsel argued:

> The Erb article was not published until some three months after [Dr.] Kim['s] public disclosure of the Amelio process and Hughes abandoned the Erb/Su work. If you look at PX 1055, it was abandoned. What did they do? They went to a stepped oxide.
>
> If Erb and Su ever had a self-aligned implanted barrier, it was abandoned in favor of something else.

[TR 4274]. Loral apparently based this abandonment argument on Hughes' decision to pursue other technology or Dr. Erb's decision to publish, rather than seek a patent for, his invention. This argument, to which Sony had no opportunity to respond, is incorrect as a matter of law. *International Glass Co. v. United States,* 408 F.2d 395, 403 (Ct.Cl.1969) (per curiam). Dr. Erb did not abandon his invention by publication. Inventors may reap their public reward for innovation as they see fit, either by publication or by seeking exclusive legal rights. Nonetheless, because the jury instructions mentioned abandonment in its recitation of priority rules, the jury may well have seized this incorrect

argument (bolstered by Sony's inability to respond) to deny Dr. Erb's work its proper prior art status.

The court also notes that the parties offered extensive evidence at trial on the same surface limitation in claim 1 of the '674 patent, including TEMs and SEMs. However, in the light of the court's claim construction on this limitation and the evidence offered by Loral during trial, the court finds substantial evidence supports the jury's verdict on this limitation.

Sony has moved for a new trial in the alternative. Fed.R.Civ.P. 59 gives this court authority to grant new trials on all or part of the issues tried to a jury "for any of the reasons for which new trials have heretofore been granted in actions at law in the courts of the United States." Under this rule, a court may grant a new trial where the verdict is against the great weight of the evidence. *Byrd v. Blue Ridge Rural Elec. Coop., Inc.,* 356 U.S. 525, 540, 78 S.Ct. 893, 902, 2 L.Ed.2d 953 (1958). Even where substantial evidence might support a jury's verdict, a court may grant a new trial. *Litton,* 87 F.3d at 1576; *Song v. Ives Labs., Inc.,* 957 F.2d 1041, 1047 (2d Cir.1992); *Dyer v. MacDougall,* 201 F.2d 265, 272 (2d Cir.1952) (Hand, J.). As the United States Court of Appeals for the Second Circuit has expressly recognized, Rule 59 authorizes this court to sit as the thirteenth juror in deciding a motion for a new trial. *Dyer,* 201 F.2d at 272. In other words, this court may weigh the evidence and need not view it in the light most favorable to the verdict winner. *Song,* 957 F.2d at 1047. Because the record lacks sufficient evidence to support the jury's verdict, the court, in the alternative, grants Sony's motion for a new trial on

infringement of the asserted claims of the '674 and '485 patents under the doctrine of equivalents.

For the reasons stated above, with the Erb article as prior art, no reasonable jury could find that Sony's processes infringe claim 1 of the '674 patent under the doctrine of equivalents. The court will therefore grant Sony's motion for judgment as a matter of law on this issue. In the alternative, the court grants Sony's motion for a new trial because the great weight of the evidence is against the verdict. Finally, because the court finds no infringement of claim 1 of the '674 patent as a matter of law, the court also reverses the jury's verdict finding inducement to infringe of this claim. Without direct infringement, a party cannot be liable for inducement to infringe. *Met-Coil Sys. Corp. v. Korners Unlimited, Inc.*, 803 F.2d 684, 687 (Fed.Cir.1986).

Prosecution History Estoppel on '674

As indicated, this court submitted the legal issue of prosecution history estoppel to the jury for an advisory verdict. The jury determined that the prosecution history did not limit application of the doctrine of equivalents. Because prosecution history estoppel is a question of law, *LaBounty Mfg., Inc. v. United States Int'l Trade Comm'n*, 867 F.2d 1572, 1576 (Fed.Cir.1989), this court applies independently the law to the file wrapper evidence in this case.

Prosecution history estoppel places a limitation on the permissible scope of equivalents. *Charles Greiner*, 962 F.2d at 1036. An applicant's statements during prosecution can estop the patentee from later reclaiming as an equivalent

coverage surrendered to acquire the patent. *Pall,* 66 F.3d at 1218; *see Wang Labs.*, 993 F.2d at 868. Stated otherwise, a patentee cannot "recapture through equivalence . . . coverage given up [by argument or amendment] during prosecution." *Hormone Research Found., Inc. v. Genentech, Inc.*, 904 F.2d 1558, 1564 (Fed.Cir.1990) (quoting *Loctite,* 781 F.2d at 870).

This estoppel limits the application of the doctrine of equivalents in two primary circumstances. In the classic format, estoppel arises "when a change of claim scope is made in order to overcome an examiner's rejection based on prior art." *Pall,* 66 F.3d at 1219. In addition, the estoppel may arise (without a rejection based on prior art) when an applicant unmistakably and clearly disavows claim coverage during prosecution in an effort to obtain the patent. *See Southwall Technologies, Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1580 (Fed.Cir.), *cert. denied,* __ U.S. __, 116 S.Ct. 515, 133 L.Ed.2d 424 (1995). In this latter type of estoppel, however, this disavowal must be *unequivocal and unmistakable:*

> While it is true that a patentee's *unmistakable assertions* to the PTO in support of patentability, whether or not they were truly required to secure allowance of the claim, will estop the patentee from obtaining protection of the subject matter surrendered thereby, . . . it is difficult to conclude, in light of the truly equivocal nature of the claim phrase [at issue] and the conflicting evidence in the prosecution history, that [the patentee] surrendered protection . . . with *the clarity* that prosecution history estoppel requires.

Athletic Alternatives, 73 F.3d at 1582 (emphasis added); *accord Texas Instruments, Inc. v. United States Int'l Trade Comm'n,* 988 F.2d 1165, 1174 (Fed.Cir.1993); *Southwall,* 54 F.3d at 1581.

The prosecution history estoppel issue in this case once again focuses on the sequence of the '674 process steps. As construed by this court, the '674 patent discloses an express sequence to make a CCD. Under the '674 process, an insulated gate serves as a mask during implantation of the barriers. Thus, step three — insulation (or oxidation) of the gate — precedes step four — implantation of the barriers. The Sony process implants the barrier before insulating the gate. Sony thus uses step four before step three. Or, in other words, Sony uses a naked gate (not an insulated gate) as a mask for implanting the barriers. Thus, for this issue, the question is whether Amelio relinquished during prosecution patent coverage for naked gate processes in a manner sufficient to create an estoppel.

With those basic propositions in mind, this court examines the administrative process that yielded the '674 patent. As originally filed, claim 1 of the '674 patent read, in pertinent part:

> 1. A process for fabricating a semiconductor structure comprising the steps of:
>
> selectively forming a plurality of spaced-apart first gate electrodes;
>
> selectively forming a second gate electrodes between and spaced slightly

apart from adjacent ones of said first gate electrodes; and

forming barrier regions in a semiconductor substrate beneath said second gate electrodes, said barrier regions extending in said substrate beyond a boundary defined by the outer perimeter of said second gate electrodes toward but not reaching an outer boundary defined by the outer perimeter of said first gate electrodes, thereby providing barrier regions having outer boundaries precisely aligned between the boundaries of said first and said second gate electrodes.

Claim 2, as originally filed, read:

2. The process as recited in claim 1 and further comprising the step of forming a first insulation layer over said first gate electrodes prior to the step of forming barrier regions in said semiconductor substrate, whereby the outer lateral surfaces of said first insulation layer are aligned with the corresponding surface of said barrier regions.

As originally filed, application claim 1 provided no explicit order or sequence of process steps. The language of this original claim covered both naked and insulated gate masking processes. In fact, original application claim 2 specified the

sequence of insulating the electrode "prior to" formation of barrier regions in the semiconductor substrate. To underscore that claim 1 included naked gate processes, the latter, more specific, dependent claim 2 expressly covered insulated gate processes.

After filing the application claim 1 without a sequence, the applicant then filed a preliminary amendment, before an examiner's review, cancelling claims 1-10 and adding claims 17-27. Amended claims 17 and 18 read:

> 17. A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of:
>
> > selectively applying at least on layer of insulation material to said semiconductor substrate[;]
> >
> > selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;
> >
> > forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the respective first gate electrodes; and

> selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, one of said second gate electrodes substantially occupying the space between each of said plurality of first gate electrodes.
>
> 18. The process as recited in claim 17 further comprising the step of forming a first insulation layer over said plurality of first gate electrodes prior to the step of forming implanted barrier regions in said semiconductor substrate, whereby the edges of said implanted barrier regions are aligned with the vertical edges of the first insulation layer on the respective first gate electrodes.

In making these amendments the applicant stated in the remarks section, that these changes were made "in order to ensure that they particularly point out and distinctly claim the invention taught by the application." Application claim 17 still recited a naked gate process because it envisioned formation of barrier regions "in intervals between . . . spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the respective first gate electrodes." Moreover application claim 18 specified an insulated gate process as an additional separate claim. Thus, in its early iterations, Amelio's claims seemed to claim both a naked gate and an insulated gate process.

Appendix D

The examiner rejected claims 17 and 18 as vague and indefinite under 35 U.S.C. § 112 and as obvious under 35 U.S.C. § 103. In addition, the examiner rejected claim 17 as being anticipated under 35 U.S.C. § 102. The examiner explained that claims 17-20 were "unpatentable over Walden [United States Patent 3,852,799] in view of Boleky [United States Patent 3,745,647]." The examiner explained: "It is considered obvious that the oxide surrounding Walden's first electrodes 46, 49 etc. may be used as [a] mask in forming his regions 43, 45 etc[.], as in Boleky at 20." In addition, the examiner explained the reasons for the section 112 rejection:

> In claim 17, the edges of the [implanted barrier] regions are not aligned with the first gate electrodes but are aligned with the oxide surface covering the first gate electrodes and it is not clear that only one second electrode occupies the spaces between all of the first gate electrodes. Also, no apparent relationship has been set forth between the two sets of gate electrodes and the barrier region.

Thus, the PTO rejected Amelio's claims as unpatentable over prior art. In response to this Office Action, the applicant amended claim 17 and cancelled claim 18. Specifically, the applicant narrowed claim 17 to cover only insulated gate masking:

> 17. (amended) A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of

selectively apply at least one layer of insulation material to said semiconductor substrate;

selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;

forming a first insulation layer over said plurality of first gate electrodes;

forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the *vertical edges of the insulation layer on the* respective first gate electrodes; and

selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, one of said second gate electrodes substantially occupying the space between each of said plurality of first gate electrodes[.], *each of said second gate electrodes comprising in combination with an individual adjacent first gate electrode*

Appendix D

a composite electrode for a charge coupled element.

(bracketed material deleted, underlined material added). In the Remarks section of the amendment, the applicant explained his effort to overcome the obviousness rejection:

> It is submitted that the thrust of the Boleky reference is the lateral inward diffusion of the dopant impurities as shown by the points of penetration 40. The use of the insulated gate as a mask shows a technique that is generally known in the semiconductor art. The present invention is directed to a *process sequence which includes this masking feature as one step* but which further includes the unique and distinctive steps of connecting a single first gate electrode to a single adjacent second gate electrode to form a composite gate electrode. Thus, not only is self-alignment of the implanted barriers obtained, but a [composite] electrode for inclusion in a charge-coupled element is formed. This sequence of steps goes far beyond the teaching of Boleky and, therefore, is not rendered obvious by it. (emphasis added)

Thus, when the PTO rejected claim 17, Amelio changed claim 17 to specify only the use of insulated gates as a mask. [STX 499 at A55]. As amended, claim 17 covered only "forming a first insulation layer over said plurality of first gate electrodes" followed by a step of "forming implanted barrier regions . . ., the edges of said implanted barrier

regions being aligned with the vertical edges of the insulation layer on the respective first gate electrodes." In remarks, the applicant characterized claim 17 as "directed to a process sequence" which included the specific "masking feature" of an insulated gate as "one step." Moreover, the applicant closes his explanation of his amendment by clarifying: "this *sequence of steps* [insulation before implantation] goes far beyond the teaching of Boleky [the prior art invoked by the PTO] and, therefore, is not rendered obvious by it." (emphasis added).

In other words, the applicant expressly narrowed his claim to a process sequence of step 3 before step 4 (insulated gate masking) in response to a PTO prior art rejection. Moreover, the applicant narrowed the scope of his claims to abandon naked gate masking. Thus, the applicant invoked the classic prosecution history estoppel rule precluding recapture of abandoned claim scope.

Loral now protests that the applicant did not amend his claims to overcome prior art rejections, but only to overcome the examiner's § 112 rejection. The applicant's double reference to the process sequence and direct reference to the Boleky prior art belies this protestation. Moreover another related incident also reveals the applicant's motivation to overcome prior art during prosecution. While prosecuting the '674 patent, Fairchild, Loral's predecessor, prosecuted as well a divisional apparatus application based on the application that ripened into the '674 patent. In that divisional application, Fairchild used claim language which encompassed not only structures made by the claimed insulated gate processes but also structures made by naked

gate processes. The examiner rejected these apparatus claims as anticipated by the Erb article.[5]

Despite this rejection of the apparatus application as anticipated by Erb, Fairchild did not cite the Erb article to the examiner for the related process application. Because the only difference between the Erb process and the '674 process is naked as opposed to insulated gate masking, the applicant's failure to cite Erb in the '674 examination suggests that Fairchild relied during prosecution on that difference to avoid citing Erb as relevant prior art. Thus, in light of the duty to disclose material information during prosecution, *see Norton v. Curtiss,* 433 F.2d 779, 793-94 (CCPA 1970), a detailed examination of the public prosecution record shows that Fairchild relied again on the process sequence (step 3 before 4) to avoid potentially crippling prior art.

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5. Fairchild abandoned its apparatus application after the rejection based on Erb. [STX 502]. This apparent acquiescence in the examiner's rejection supports this court's conclusion that the Erb reference is prior art. If Fairchild had questioned the prior art status of the Erb reference during prosecution, a time much closer to the actual inventive events, it could have "sworn behind" the Erb article under PTO Rule 131, 37 C.F.R. 1.131. Instead, at that time when evidence was more likely obtainable, Fairchild abandoned its apparatus claims based on a rejection in light of Erb.

By the way, the PTO processed these divisional applications in two separate art units. Art Unit 325 handled the process claims which resulted in the '674 patent. Art Unit 254 rejected the apparatus claims.

In sum, the applicant undeniably changed the original claims to exclude naked gate processes and specifically include only insulated gate processes. This change came in response to a rejection based on prior art. When explaining these changes, the applicant expressly relied upon a process sequence to distinguish over prior art. With this narrowing of claim scope, the applicant persuaded the PTO to issue a patent. After thus abandoning processes with implantation before insulation. Loral cannot now recapture that claim scope as an equivalent.

In the alternative, this court examines Loral's contention that Amelio's attorney amended the claims solely to address the section 112 rejection and not to distinguish over the prior art. At most this argument would remove Loral from the classic prosecution history estoppel category and require a showing of unmistakable surrender or abandonment of the naked gate processes. An examination of the administrative record, however, discloses sufficient clarity and unmistakability to invoke an estoppel under Loral's alternative argument as well.

The claims themselves show an unmistakable change in scope. Amelio did narrow his claims from language that included naked gate masking to language that clearly precluded implantation before insulation. Moreover, Amelio's attorney explained unmistakably that this change claimed only a particular chronological sequence of steps. In this context, the related divisional apparatus application shows that Fairchild relied more than once on that sequence in an effort to obtain the '674 patent. Under this alternative form of prosecution history estoppel, Loral also cannot

recapture claim scope unmistakably disavowed during prosecution.

In sum, the public may justifiably rely on the prosecution history to interpret the scope of claim language. *See Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 952 (Fed.Cir.1993). Where an applicant has surrendered claim scope to obtain exclusive rights, the public may rely on that abandonment. *See id.* Thus, this court concludes that the prosecution history prevents Loral from asserting infringement of claim 1 of the '674 patent under the doctrine of equivalents.

Sony's Defense of Laches

Having resolved the issues tried to the jury, this court turns next to resolution of the equitable issues tried to the bench over the course of two days in April 1996. As noted above, Sony contends laches and equitable estoppel bar Loral's recovery in this case. Equitable estoppel and laches fall within the sound discretion of the trial court. *Aukerman Co. v. R.L. Chaides Constr. Co.*, 960 F.2d 1020, 1041 (Fed.Cir.1992) (en banc); *Jamesbury Corp. v. Litton Indus. Prods., Inc.*, 839 F.2d 1544, 1553 (Fed.Cir.), *cert. denied*, 488 U.S. 828, 109 S.Ct. 80, 102 L.Ed.2d 57 (1988). Both defenses ultimately depend on underlying factual determinations. *Hemstreet v. Computer Entry Systems Corp.*, 972 F.2d 1290, 1292 (Fed.Cir.1992).

The defense of laches arises when a patentee "neglect[s] or delay[s] . . . bringing suit to remedy an alleged wrong, which taken together with lapse of time and other circumstances, causes prejudice to the adverse party and

operates as an equitable bar." *Gasser Chair Co., Inc. v. Infanti Chair Mfg., Corp.*, 60 F.3d 770, 773 (Fed.Cir.1995) (quoting *Aukerman*, 960 F.2d at 1028-29). To show laches, the defendant must prove by a preponderance of the evidence: (1) unreasonable and inexcusable delay in filing suit, and (2) material prejudice resulting from the delay. *Aukerman*, 960 F.2d at 1032-33. A rebuttable presumption of laches arises in patent infringement cases for delays longer than six years. *Id.* at 1034. Nonetheless, as an equitable doctrine, laches does not operate on mechanical rules. *Id.* at 1032 (internal quotations and citations omitted). The reasonableness of a delay in bringing suit depends on the facts and circumstances of each case. *Gasser*, 60 F.3d at 773; *Aukerman*, 960 F.2d at 1032; *Meyers*, 912 F.2d at 1462-63.

In determining when the clock begins ticking for laches, this court must consider when the patent owner knew or should have known of defendant's alleged infringement. *Jamesbury*, 839 F.2d at 1552. Beginning in 1979, Sony had a license to practice the '674 process. Therefore, when the license expired in July 1985, Fairchild knew or should have known of Sony's continued use of the '674 process. The record corroborates that conclusion. Dr. Amelio's deposition testimony, for instance, revealed his perception of the number of companies infringing his process in 1982: "My impression was that virtually everyone was using the process by that time." [STX 2012]. Furthermore, Dr. Wen, Director of Engineering for Loral Fairchild, and Dr. Dyck, Fairchild Camera and Instrument's CCD Division, also testified about their suspicions of widespread infringement. [Wen Dep. 1/27/93 at 142; Dyck Dep. 12/3/93 at 517-18].

Appendix D

During this court's bench trial, Sony sought to show that Loral knew or should have known of Sony's alleged infringement as early as 1982. Loral responded that its separate divisions — Fairchild Camera and Instrument Corporation in Palo Alto, California, and Fairchild Weston Systems in New York — did not share confidential information. Accordingly, Loral argues that the patent holder, Fairchild Weston, did not know or have a reason to know of the infringement.[6]

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6. The record suggests that both divisions should have been aware of Sony's infringement. For instance, in August 1984 Dr. Wen, Joseph Rothstein, General Manager of Fairchild's CCD Imaging Division, and Irving Hirschberg, Director of Technology Development of Fairchild Weston, visited Sony. These Loral executives solicited Sony to manufacture CCD area imagers for Fairchild. [STX 2156-2]. During these discussions in 1984, Fairchild and Sony exchanged considerable information about their technology. [STX 2156-4-6; 2156-13-16].

Loral should have also been aware of the structure of Sony's CCDs from technical publications. Hiroyuki Matsumoto and his colleagues at Sony published two papers in 1983 describing Sony's interline transfer CCD's. [STX 2148, 2149]. Harvey Balopole testified that Fairchild's California group follow the literature very carefully. [Balopole Dep. 1/29/93 at 555]. Dr. Dyck also testified that he was quite knowledgeable about CCDs and followed technical publications. [Dyck Dep. 12/3/92 at 507]. Furthermore, in 1985, Fairchild specifically requested a translation of one of Mr. Matsumoto's papers. [STX 2157-29]. Also found in Fairchild's files was an English translation of Mr. Matsumoto's first paper. Although this translation was admittedly more coarsely translated than the later article it still stated in reference to the Sony CCD:

(Cont'd)

This debate, however, was largely irrelevant because the '674 is a process patent.[7] Before enactment of the 1988 Process Patent Amendment Act. Process Patent Amendment Act of 1988, Pub.L. No. 100-418, § 9006(a), 102 Stat. 1107, 1567 (1988), the Patent Act provided no remedy against a manufacturer who used a patented process outside the United States to fabricate a product for sale within the United States. Therefore, before the 1989 effective date of the 1988 Act, a patent owner could not seek damages or injunctions under the Patent Act for extraterritorial use of processes patented in the U.S.

Before 1989, the U.S.Code only offered a very limited opportunity for relief to a patentee against importation of products using a patented process. This limited opportunity was a Section 337 action against the alleged infringer in the U.S. International Trade Commission. *See* 19 U.S.C. §§ 1337

(Cont'd)

> A 2-layer polysilicon overlap gate electrode structure is used for vertical and horizontal readout CCD registers. Charge transfer is the 2-phase driving n-channel flush type in which substrate concentration varies with ion implantation.

The translation bears a note indicating that it had been in the possession of at least "D. Wen" and "Rudy [Dyck]." [STX 2019]. There were also handwritten notes indicating that Fairchild recognized as referring to the "Sony 16" chip.

7. The parties did not contest laches with respect to the '485 patent because this court had already determined on summary judgment that Loral's failure to require marking precludes pre-suit damages. *Loral,* 906 F.Supp. at 818.

and 1337(a). Despite the grave limitations of this purported remedy, Sony contends that Fairchild's decision to forego a Section 337 action after expiration of its license agreement in July 1985 gives rise to laches.

The inadequacy of a pre-1989 Section 337 remedy belie Sony's contention. *See* S.Rep. No. 83, 100th Cong., 1st Sess. 30 (1987); H.R.Rep. No. 60, 100th Cong., 1st Sess. 5 (1987) (Congress found existing remedies available through the International Trade Commission (ITC), 19 U.S.C. § 1337 (1988), inadequate because, among other reasons, the ITC provides only nonmonetary relief). Simply to convince the ITC to initiate a section 337 action, a domestic industry had to make difficult showings. First, the commission required the domestic industry to manufacture or have manufacture-related activity under the patented process. Loral had very limited manufacturing capacity from 1985-89. In fact, the record shows that Loral solicited Sony to produce CCDs for Loral's defense contracts because Loral lacked the capacity to meet this demand on its own. Loral's inability to support the growing camcorder market in this era would have likely been a significant hurdle to initiation of a Section 337 action after 1985.

Another requirement for initiation of a 337 action was proof of economic injury to a domestic industry. Once again, Loral's very limited manufacturing capacity militated against a showing on this factor. Loral was not even in competition with Sony in the 1985-89 era. Rather Loral sought to become a customer of Sony. Thus, Loral would have faced a very difficult, if not impossible, burden to show injury to a domestic industry.

Moreover, even if Loral had undertaken the expense and difficulty of overcoming the manufacturing-capacity and injury-to-domestic-industry hurdles, these showings only were relevant to instituting a section 337 action. Winning the action would require additional expense and legal effort. At the conclusion of what might be an expensive twelve-to eighteen-month effort, Loral still would gain no money damages from its Section 337 case. Moreover a 337 proceeding has no res judicata effect. [Transcript of Trial, April 16, 1996, at 504]. In determining a laches defense, a court must consider and weigh any justification offered by the plaintiff as justification for delay in bringing its suit. *Aukerman,* 960 F.2d at 1033.

In sum, Loral acted reasonably in its decision to forego instituting an expensive section 337 action. Because Fairchild was not in competition with Sony's color camcorder business, it faced unlikely prospects of success in a Section 337 action, which might have yielded only limited remedies at best. Moreover, because of these limitations, Sony felt no reluctance to step up its CCD production and importation. The record shows that Sony felt no deterrent threat of a Section 337 action. Therefore, this court determines that Fairchild's decision to forego its pursuit of remedies for process patent infringement under Section 337 was neither unreasonable nor inexcusable.

Within two years of the effective date of the 1988 Act, Loral initiated this suit. Under the equitable circumstances of this case, that period was not an unreasonable delay. For instance, Loral bought Fairchild in 1989. Loral took only a reasonable time to ascertain which Sony products infringed

Loral's newly acquired patents. With the wide variety of potential products and the difficulty of ascertaining infringing activity, two years was a reasonable period for Loral's investigation.

The circumstances of this case show no unreasonable delay in Loral's initiation of its patent infringement action. From 1985 until 1989, Loral had only the limited Section 337 action available. Loral's failure to initiate a Section 337 action was not an unreasonable nor unexcusable delay. After 1989, Loral proceeded in a reasonable fashion to initiate its suit. Thus, the circumstances of Loral's conduct do not warrant invocation of the equitable defense of laches.

The second factor, material prejudice resulting from patentee's delay, "may be either economic or evidentiary." *Aukerman,* 960 F.2d at 1033. The change in economic position must occur during the period of delay. *Id.* "It is not enough that the alleged infringer changed his position — i.e., invested in production of the allegedly infringing device. The change must be because and as a result of the delay." *Hemstreet,* 972 F.2d at 1294.

In this case, this court has found no unreasonable delay. However, even if this court had determined that Loral unreasonably delayed by foregoing a Section 337 remedy, that period of delay would cover only 1985-89. During that period, Sony suffered little, if any, economic damage. Sony bought Fairchild's Japanese semiconductor facility in 1987. [STX 2123A]. Not until 1989 did Sony increase its investment in CCD production by expanding the entire Kokobu production line and by starting production at its

Nagasaki plant. [STX 710]. By that time, Loral had undertaken its infringement investigation under the 1988 Act. During any alleged delay period, Sony suffered little, if any, economic prejudice.

Moreover, even if Sony has suffered some evidentiary prejudice, *Aukerman* gives the trial court wide discretion in applying laches. As the *Aukerman* court explained, a court need not find laches in every case where a defendant proves undue delay and prejudice. 960 F.2d at 1036. That court went on to explain: "[L]aches is not established by undue delay and prejudice. Those factors merely lay the foundation for the trial court's exercise of discretion." *Id.* This court may, and does, deny this defense because evidence of other factors would make it inequitable to recognize the defense. *See id.* at 1036.

Sony's Defense of Equitable Estoppel

In addition to laches, Sony contends equitable estoppel bars Loral's suit. The equitable defense of estoppel may entirely bar an infringement suit. Equitable estoppel requires proof of three elements: (1) the patent holder — through misleading conduct, statements, or inaction — leads the alleged infringer to reasonably infer that it does not intend to enforce the patent against the alleged infringer; (2) the alleged infringer relies on the misleading conduct; and (3) the reasonable reliance materially prejudices the alleged infringer. *ABB Robotics, Inc. v. GMFanuc Robotics Corp.*, 52 F.3d 1062, 1063 (Fed.Cir.), *cert. denied*, __ U.S. __, 116 S.Ct. 306, 133 L.Ed.2d 211 (1995). Unlike laches, this defense involves no presumption. Therefore, a party relying

on an estoppel defense must prove each element. *Aukerman*, 960 F.2d at 1043.

The alleged estoppel in this case arose from a series of negotiations over licenses for patents involving semiconductor inventions. In 1979, Sony entered a licensing agreement with Loral's predecessor that covered many semiconductor inventions, including the '674 patent. This license lapsed in July 1985. Accordingly, Sony and Loral's predecessor entered negotiations over the extension of the agreement. In September 1985, Sony sent a letter to Fairchild noting the lapse of their patent license agreement and requesting an extension. Fairchild responded: "We are willing to extend the 1979 License Agreement and await your specific proposal."

This response alone, however, did not indicate acceptance of Sony's extension proposal. To the contrary, Fairchild simply indicated willingness to consider alternatives for extension. The parties had reached no firm agreement to continue their licensing relationship, let alone the specifics of such a contractual agreement. Fairchild's terse response could not mislead Sony to believe Fairchild had accepted an extension proposal. To this point, Fairchild had misled no one. Moreover Sony had no reasonable basis to esteem itself exempt from legal action for patent infringement.

Nonetheless Sony responded with optimism: "Thank you for your letter dated October 4, 1985 accepting our proposal of the extension of the subject of the license agreement." Despite the optimistic tone of this letter, it did not show

reasonable reliance on misleading Fairchild conduct. It simply offered a optimistic prospect of a continuing licensing relationship. Fairchild did not respond to Sony's optimistic response. At no time did Fairchild confirm its intention to accept a formal Sony licensing extension proposal.

Mr. Taira was the Sony representative conducting the license extension negotiations with Fairchild. Mr. Taira died a year after the license expired and before Loral initiated suit. To determine the equitable estoppel issue, however, this court need not determine Mr. Taira's state of mind. The documentary evidence alone reveals Fairchild's willingness to hear proposals, not its assent to any formal extension of the licensing agreement.

In July 1986, after Mr. Taira's death, Sony again wrote Fairchild noting Fairchild's failure to respond to Mr. Taira's letter. Fairchild responded: "We will shortly advise you of our position as to extending the Agreement." Fairchild did not communicate with Sony any further about the extension proposal. In other words, Fairchild's last communication with Sony reiterated that the parties had reached no licensing agreement. Indeed, Fairchild expressly asserted that it had not agreed to any extension of the 1979 agreement.

In weighing the first element of equitable estoppel, this court must examine whether Fairchild's silence or inaction amounts to misleading conduct. To establish the first element of equitable estoppel, Sony must show that Fairchild's statements and conduct supported an "inference that [Fairchild] did not intend" to bring an infringement claim against Sony. *Meyers v. Asics Corp.*, 974 F.2d 1304, 1308

(Fed.Cir.1992) (quoting *Aukerman,* 960 F.2d at 1042). At most Sony can show silence in the face of Sony's offers to extend the licensing agreement.

The Federal Circuit has discussed examples in which silence combined with other facts does or does not mislead an alleged infringer to reasonably infer that the patentee had foregone pursuit of its patent rights against an alleged infringer. In *Meyers v. Brooks Shoe, Inc.,* the Federal Circuit stated: "[W]e do not believe that a suggestion of infringement coupled with an offer to license followed by silence would suffice to establish equitable estoppel." 912 F.2d 1459, 1464 (Fed.Cir.1990); *see MCV, Inc. v. King-Seeley Thermos Co.,* 870 F.2d 1568, 1572 (Fed.Cir.1989) (patentee expressly declined to pursue an infringement claim), *Jamesbury,* 839 F.2d at 1555 (plaintiff had eight year silence following a letter informing alleged infringer he was infringing plaintiff's patent, and another letter informing him that the matter had been referred to his attorneys); *cf. Hottel Corp. v. Seaman Corp.,* 833 F.2d 1570, 1574-75 (Fed.Cir.1987) (plaintiff's period of silence did not follow any communication indicating it would take immediate action).

As these Federal Circuit decisions show, silence alone does not amount to misleading conduct. As the Federal Circuit stated in *Aukerman,* inaction — "combined with other facts respecting the relationship or contacts between the parties" — may allow defendant to make the inference that the claim against him has been abandoned. 960 F.2d at 1042; *accord ABB Robotics,* 52 F.3d at 1064. Thus, silence alone — even silence over an extended period of time — does not amount to misleading conduct without notice of infringement

or failed licensing negotiations. *Aukerman,* 960 F.2d at 1042 (citing *Continental Coatings Corp. v. Metco, Inc.,* 464 F.2d 1375, 1379-80 (7th Cir.1972) ("In each such case the infringement notice was either withdrawn or followed by such a long period of inactivity as to justify an inference of abandonment."); *A.C. Aukerman Co. v. Miller Formless Co.,* 693 F.2d 697, 701 (7th Cir.1982) ("With a delay of this length [over six years], there has to be something significantly more than continued jousting, at least where there is no real possibility of success on the part of patentee in obtaining the solid type of license it wants."); *Jensen v. Western Irrigation & Mfg., Inc.,* 650 F.2d 165, 169 (9th Cir.1980) (threats of enforcement followed by long period of silence)). In other words, the active conduct of patentee, beyond mere silence, must also support an inference that patentee did not intend to bring an infringement action against the alleged infringer.

Loral, in this case, has not engaged in conduct which would mislead Sony to infer reasonably that Loral had abandoned any intent to initiate an infringement action. The record shows only an ongoing exchange of proposals to propose an extension of licensing negotiations. *See Hemstreet,* 972 F.2d at 1295. Thus, the character of the communications between Fairchild and Sony did not amount to misleading conduct. Sony thus had no basis for a reasonable inference that Fairchild had abandoned intentions to use legal remedies.

Moreover the period of silence which constitutes Sony's primary argument for misleading was not so prolonged as to create a misleading impression. In this case, Loral's silence

after ambiguous communications lasted about five years. Generally, the longer the delay the stronger the inference becomes. *See Aukerman,* 960 F.2d at 1044. However, because equitable estoppel is a defense in equity each case varies on its facts as to what constitutes a misleading inference. Therefore, the length of periods of silence, combined with other facts, varies in determining an inference of misleading silence. *Studiengesellschaft Kohle, m.b.H. v. Dart Indus., Inc.,* 726 F.2d 724, 728-29 (Fed.Cir.1984) (finding that five-year silence alone did not give rise to estoppel); *Hemstreet,* 972 F.2d at 1295 (noting that negotiations plus six years of silence did not justify a finding of equitable estoppel); *Advanced Hydraulics, Inc. v. Otis Elevator Co.,* 525 F.2d 477, 481 (7th Cir.), *cert. denied,* 423 U.S. 869, 96 S.Ct. 132, 46 L.Ed.2d 99 (1975) (explaining that notice of infringement plus five-year silence required finding of estoppel). Therefore, this court finds that Fairchild's conduct did not rise to the level of misleading conduct.

Fairchild's failure to sue Sony for infringement of its foreign patents also does not justify any reasonable reliance by Sony. Fairchild owned patents in Britain, France, and Hong Kong, based on the '674 patent. These foreign patents contained apparatus claims. Failure or refusal to sue on foreign patents has no relevance to the right to sue on United States patents, which are limited to acts of infringement in the United States. This case simply does not feature misleading conduct.

Under the second element of equitable estoppel, the accused infringer must show its substantial reliance on the patentee's misleading conduct. Reliance and prejudice or

harm are not the same. To demonstrate reliance, "the infringer must have had a relationship or communication with the plaintiff which lulls the infringer into a sense of security. . . ." in progressing with its business. In other words, the harm must be in direct reliance on patentee's conduct. *See Aukerman,* 960 F.2d at 1043. Although the evidence indicates that Loral was aware that Sony was probably infringing the '674 patent. Loral had no effective remedy until passage of the 1988 Process Amendments Act. Fairchild's failure to warn Sony earlier of possible infringement does not rise to the level of misleading conduct. Therefore, Sony cannot show reasonable reliance on this conduct.

Lastly, the accused infringer must show that its reliance caused it material prejudice. As with laches, prejudice may take the form of either a change in economic position or a loss of evidence. *Id.* (citing *Advanced Hydraulics,* 525 F.2d at 481-82). However, without misleading conduct and reasonable reliance, this court finds that Sony did not show any material prejudice from misleading conduct. The Federal Circuit in *Aukerman* instructed the trial courts to take into consideration, even where the three elements of equitable estoppel are present, other evidence and facts affecting the equities of the parties in exercising its discretion to allow the equitable estoppel defense. *Id.* at 1043. Because Fairchild had no viable cause of action until passage of the 1988 Process Amendments Act, this court denies Sony's request to bar this suit under equitable estoppel.

CONCLUSION

The court grants Sony's motion for judgment as a matter of law as to infringement of the asserted claims of the '485

and '674 patents. With that ruling, the court also grants Sony's motion for judgment as a matter of law as to inducement to infringe of claim 1 of the '674 patents. The court denies Sony's motion on all other grounds. Additionally, the court finds prosecution history estoppel precludes infringement of the asserted claims of both the '485 and '674 patents under the doctrine of equivalents. Finally, the court finds that neither laches nor equitable estoppel bar recovery in this suit. In the alternative, the court grants Sony's motion for a new trial on infringement of the asserted claims of the '485 and '674 patents under the doctrine of equivalents. The court will enter an order in accordance with this Opinion.

ORDER GRANTING SONY'S MOTION FOR JUDGMENT AS A MATTER OF LAW, FOR A NEW TRIAL, AND ON PROSECUTION HISTORY ESTOPPEL

For the reasons set forth in the foregoing Opinion of this date, IT IS HEREBY ORDERED as follows:

1. Sony's motion for judgment as a matter of law is granted.

2. In the alternative, Sony's motion for a new trial on the issue of infringement of the '674 and '485 patents is granted.

3. Sony's motion on prosecution history estoppel is granted.

4. Within five (5) days from the date of this order, the parties shall contact the court to schedule a telephone conference to discuss further proceedings in this matter. The court intends to issue an order certifying this case for immediate appeal pursuant to Fed.R.Civ.P. 54(b).

APPENDIX E — ORDER OF THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT DENYING PETITION FOR REHEARING DATED AND FILED JULY 16, 1999

United States Court of Appeals for the Federal Circuit

97-1017

LORAL FAIRCHILD CORPORATION,

Plaintiff-Appellant,

v.

SONY CORPORATION and SONY ELECTRONICS INC.,

Defendants-Appellees,

and

MATSUSHITA ELECTRIC INDUSTRIAL COMPANY, LTD., MATSUSHITA ELECTRIC CORPORATION OF AMERICA, NEC CORPORATION, NEC AMERICA, INC., NEC TECHNOLOGIES, INC., CANON, INC., CANON U.S.A., INC., TOSHIBA CORP., TOSHIBA AMERICA, INC., TOSHIBA AMERICA CONSUMER PRODUCTS, INC., TOSHIBA AMERICA INFORMATION SYSTEMS, INC., TOSHIBA AMERICA ELECTRONIC COMPONENTS, INC., HITACHI, LTD., HITACHI HOME ELECTRONICS (AMERICA), INC., FUJI PHOTO FILM CO., LTD., FUJI PHOTO FILM USA INC., SANYO ELECTRIC CO., LTD., SANYO FISHER (USA) CORP., MITSUBISHI ELECTRIC CORP., MITSUBISHI ELECTRIC SALES AMERICA, LG ELECTRONICS INC., LG ELECTRONICS U.S.A., INC., SAMSUNG ELECTRONICS CO., LTD., SAMSUNG

Appendix E

ELECTRONICS AMERICA, INC., NATIONAL SEMICONDUCTOR CORPORATION, and FAIRCHILD SEMICONDUCTOR CORP.,

Defendants.

ORDER

A combined petition for rehearing and suggestion for rehearing en banc having been filed by the APPELLANT, and the petition for rehearing having been referred to the panel that heard the appeal, and thereafter the suggestion for rehearing en banc having been referred to the circuit judges who are in regular active service,

UPON CONSIDERATION THEREOF, it is

ORDERED that the petition for rehearing be, and the same hereby is, DENIED and it is further

ORDERED that the suggestion for rehearing en banc be, and the same hereby is, DECLINED.

The mandate of the court will issue on July 23, 1999.

Circuit Judge CLEVENGER, Circuit Judge RADER and Circuit Judge SCHALL did not participate in the vote.

FOR THE COURT,

s/ Jan Horbaly (AV)
Jan Horbaly
Clerk

Dated: July 16, 1999

APPENDIX F — JUDGMENT AND JURY VERDICT OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK DATED AND FILED FEBRUARY 14, 1996

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

CV-92-0128(ARR)(RRR)

LORAL FAIRCHILD CORPORATION,

Plaintiff,

v.

VICTOR COMPANY OF JAPAN, LTD., ET AL.,

Defendants.

CV-91-5056(ARR)(RRR)

LORAL FAIRCHILD CORPORATION,

Plaintiff,

v.

MATSUSHITA COMPANY OF JAPAN LTD., ET AL.,

Defendants.

JUDGMENT IN A CIVIL CASE
ON LIABILITY

Appendix F

☒ Jury Verdict. This action came before the Court for a trial by jury. The issues have been tried and the jury has rendered its verdict in this separated trial for the plaintiff Loral Fairchild Corporation and against *only* the defendants Sony Corporation and Sony Electronics, Inc. on liability as indicated on the attached form of verdict.

* * *

IT IS ORDERED AND ADJUDGED: that the defendants Sony Corporation and Sony Electronics, Inc. are liable to the plaintiff Loral Fairchild Corporation as indicated on the attached form of verdict.

February 14, 1996
Date

ROBERT C. HEINEMANN
CLERK

s/ Frank P. Cistellano
(By)Deputy Clerk

Appendix F

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

91 Civ. 5056 (ARR)

LORAL FAIRCHILD CORP.,

Plaintiff,

v.

MATSUSHITA ELECTRICAL INDUSTRIAL COMPANY, LTD., *et al.*,

Defendants.

---

92 Civ. 128 (ARR)

LORAL FAIRCHILD CORP.,

Plaintiff,

v.

VICTOR COMPANY OF JAPAN, LTD., *et al.*,

Defendants.

Special Jury Verdict Form

Instructions:

Answer each of the following questions by placing an "X" in the space next to the finding of the jury.

Appendix F

Ownership

1. Has Loral Fairchild proven by a preponderance of the evidence that it owns the '485 Patent?

YES _X_ (For Loral Fairchild)
NO ____ (For Sony)

2. Has Loral Fairchild proven by a preponderance of the evidence that it owns the '674 Patent?

YES _X_ (For Loral Fairchild)
NO ____ (For Sony)

Infringement of the '674 Patent

1. Has Loral Fairchild proven by a preponderance of the evidence that Sony's processes for manufacturing CCDs infringe claim 1 of the '674 Patent under the Doctrine of Equivalents?

YES _X_ (For Loral Fairchild) (Go to Attachment A)
NO ____ (For Sony)

2. Has Sony proven by a preponderance of the evidence that Dr. Amelio surrendered or abandoned a 4-before-3 process sequence during the prosecution history of the '674 Patent?

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

3. Has Loral Fairchild proven by a preponderance of the evidence that it is not asserting infringement of a process disclosed by the prior art or obvious in view of the prior art?

YES _X_ (For Loral Fairchild)
NO ____ (For Sony)

Prior Art

1. Is the Erb article prior art?

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

2. Is the work of Su/Erb prior art?

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

Validity of the '674 Patent

1. Did Sony prove by clear and convincing evidence that claim 1 of the '674 Patent is invalid and obviousness?

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

Appendix F

Infringement of the '485 Patent

1. Has Loral Fairchild proven by a preponderance of the evidence that Sony's CCDs infringe claims 1 and 3 of the '485 Patent under the Doctrine of Equivalents?

YES _X_ (For Loral Fairchild) (Go to Attachment B)
NO ____ (For Sony)

2. Has Loral Fairchild proven by a preponderance of the evidence that Sony's products containing CCDs infringe claim 7 and 8 of the '485 Patent under the Doctrine of Equivalents?

YES _X_ (For Loral Fairchild) (Go to Attachment C)
NO ____ (For Sony)

3. Has Sony proven by a preponderance of the evidence that Dr. Early abandoned or surrendered a charge sink that covers Sony's substrate drain during the prosecution history.

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

4. Has Loral Fairchild proven by a preponderance of the evidence that it was not asserting infringement based on a structure disclosed in the prior art?

YES _X_ (For Loral Fairchild)
NO ____ (For Sony)

Appendix F

Validity of the '485 Patent

1. Did Sony prove by clear and convincing evidence that claims 1 and 3 of the '485 Patent are invalid for obviousness?

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

2. Did Sony prove by clear and convincing evidence that claim 7 of the '485 Patent is invalid for obviousness?

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

3. Did Sony prove by clear and convincing evidence that claim 8 of the '485 Patent is invalid for obviousness?

YES ____ (For Sony)
NO _X_ (For Loral Fairchild)

Inducing Patent Infringement

1. Has Loral Fairchild proven by a preponderance of the evidence that Sony Corporation induced infringing acts and that it knew or should have known that its actions would aid and abet another's infringement of the '674 Patent?

YES _X_ (For Loral Fairchild)
NO ____ (For Sony)

2. Has Loral Fairchild proven by a preponderance of the evidence that Sony Corporation induced infringing acts and that it knew or should have known that its actions would aid and abet another's infringement of the '485 Patent?

YES ____ (For Loral Fairchild)
NO _X_ (For Sony)

Signed,

Dated: 2/14/96

s/
Jury Foreperson

Appendix F

Attachment A
(CCDs Which Infringe Claim 1 of the Amelio '674 Patent)

Instructions:
Place an "X" in the space next to the CCD if you find that the manufacturing process infringes Claim 1:

Area CCDs:

ICX008	X	
ICX016	X	
ICX018	X	
ICX021	X	
ICX022	X	
ICX024	X	
ICX032	X	
ICX040	X	
ICX026	X	
ICX027	X	
ICX026 (Type II)		X
ICX028	X	
ICX030	X	
ICX031	X	
ICX038	X	
ICX039	X	
ICX044	X	
ICX052	X	
ICX054	X	
ICX055	X	
ICX058	X	
ICX059	X	

Appendix F

Linear CCDs:

ILX501	X
ILX101	X
ILX503	X
ILX504	X
ILX505	X
ILX508	X

Delay Line CCDs:

DL Type I:

CX23039	X
CXL1001	X
CXL1003	X
CXL1004	X
CXL1008	X
CXL1009	X
CXL5001	X
CXL5002	X
CXL5003	X
CXL5005	X

DL Type II:

CXL1501	X
CXL1503	X
CXL1517	X
CXL1504	X
CXL1505	X
CXL1507	X
CXL1508	X
CXL1518	X

Appendix F

DL Type III:

CXL1506	X
CXL5502	X
CXL5504	X
CXL5505	X
CXL5506	X
CXL5507	X
LC7975	X
CXL 7918	X
CXL7936	X

Appendix F

Attachment B
(CCDs Which Infringe Claim 1 and 3
Of The Early '485 Patent)

Instructions:
Place an "X" in the space next to the CCD model number if you find that it infringes Claims 1 and 3 of the '485 Patent:

ICX022	X
ICX024	X
ICX026 Type I	X
ICX026 Type II	X
ICX027	X
ICX032	X
ICX038	X
ICX039	X
ICX040	X
ICX044	X
ICX045	X
ICX052	X
ICX054	X
ICX055	X
ICX058	X
ICX059	X

Appendix F

Attachment C
(Products Containing CCDs That Infringe
Claims 7 and 8 Of The Early '485 Patent)

Instructions:
Place an "X" in the space next to the product model number if you find that it infringes the Claim at the top of the column:

	Claim 7	Claim 8
ARQUS-30	X	N/A
ARQUS-35	X	N/A
ATAC	X	X
AVC-D7	X	X
BVP-7	X	X
BVP-70	X	X
BVP-90	X	X
BVP-270/BVP-S270	X	X
BVP-370	X	X
BVP-375	X	X
BVP-7000HS	X	X
BVP-T7A/BVP-T7	X	X
BVP-T70	X	X
BVW-300	X	X
BVW-400	X	X
BVW-400A	X	X
BVW-570	X	X
CCB-C35	X	X
CCB-M27	X	X
CCD-F32	X	X
CCD-F35/36	X	X
CCD-F33/34	X	X

Appendix F

	Claim 7	Claim 8
CCD-F40	X	X
CCD-F45/46	X	X
CCD-F50	X	X
CCD-F55/56	X	X
CCD-F70	X	X
CCD-F73	X	X
CCD-F77	X	X
CCD-F201	X	X
CCD-F301	X	X
CCD-F401	X	X
CCD-F501	X	X
CCD-FX310	X	X
CCD-FX700	X	X
CCD-FX710	X	X
CCD-SP5/SP7	X	X
CCD-SP9	X	X
CCD-TR4	X	X
CCD-TR5	X	X
CCD-TR6	X	X
CCD-TR7	X	X
CCD-TR9	X	X
CCD-TR31	X	X
CCD-TR51	X	X
CCD-TR81	X	X
CCD-TR200	X	X
CCD-TR300	X	X
CCD-V9	X	X
CCD-V11	X	X
CCD-V101	X	X
CCD-V701	X	X

Appendix F

	Claim 7	Claim 8
CCD-V801	X	X
CCD-V99	X	X
CCD-V220	X	X
CCD-V5000	X	N/A
DMC-1200	X	N/A
DMV-4200	X	X
DXC-107A	X	X
DXC-107	X	X
DXC-151	X	X
DXC-325	X	X
DXC-327	X	X
DXC-537	X	X
DXC-750	X	X
DXC-755	X	X
DXC-760MD	X	X
DXC-930	X	X
DXC-930P	X	X
DXC-960MD	X	X
DXC-M7	X	X
EDP-10F	X	X
EVC-X7	X	X
EVO-120	X	X
EVW-325	X	X
EVW-327	X	X
HVM-52H	X	X
HVM-352	X	X
HVM-3200	X	N/A
MNC-7000	X	N/A
MVC-2000	X	X
MVC-5000	X	X

Appendix F

	Claim 7	Claim 8
MVC-A7AF	X	N/A
PCS-C121	X	X
SI-D1O	X	N/A
SI-E1O	X	N/A
SRX-4CH-VS	X	N/A
SRX-4XB-VS	X	N/A
SS-H/SS-HA	X	N/A
SS-V3	X	N/A
SSC-C350	X	X
SSC-350P	X	X
SSC-C354	X	X

APPENDIX G — ORDER OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK GRANTING IN PART AND DENYING IN PART SONY'S MOTION FOR A SUMMARY JUDGMENT OF NON-INFRINGEMENT OF THE '485 PATENT AND DENYING TOSHIBA'S MOTION FOR A SUMMARY JUDGMENT OF INVALIDITY OF THE '485 PATENT DATED DECEMBER 15, 1995

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

Civil Action No. 92-0128-ARR
(Consolidated)

LORAL FAIRCHILD CORPORATION,

Plaintiff,

v.

VICTOR COMPANY OF JAPAN, LTD., et al.,

Defendants.

Civil Action No. 91-5056-ARR

LORAL FAIRCHILD CORPORATION,

Plaintiff,

v.

MATSUSHITA ELECTRIC INDUSTRIAL COMPANY, LTD., et al.,

Defendants.

Appendix G

ORDER GRANTING IN PART AND DENYING IN PART SONY'S MOTION FOR A SUMMARY JUDGMENT OF NON-INFRINGEMENT OF THE '485 PATENT AND DENYING TOSHIBA'S MOTION FOR A SUMMARY JUDGMENT OF INVALIDITY OF THE '485 PATENT

Loral Fairchild Corporation ("Loral") alleges that defendants infringed claims 1, 3, 7 and 8 of United States Patent 3,896,485. The '485 patent discloses structural features of and various uses of charge coupled devices ("CCDs"). Defendants assert numerous defenses including invalidity, non-infringement, and lack of ownership. As to Sony, the court has scheduled this case for trial before a jury beginning on January 8, 1996.

On October 18, 1995, the court issued an Opinion and Order construing disputed portions of claim 1 of the '485 patent. Subsequently, the court granted leave to the parties to renew several motions for summary judgment. Sony renewed its motion for summary judgment contending no infringement of any claim of the '485 patent either literally or under the doctrine of equivalents. Because Sony met its burden for literal infringement but not for infringement under the doctrine of equivalents, this court grants Sony's motion in part and denies it in part.

BACKGROUND

Claim 1 of the '485 patent reads:

1. Structure which comprises:

a. a light sensing element comprising a first region of semiconductor material overlaid

by a first electrode separated from said semiconductor material by insulation, said light sensing element being capable of containing a charge packet;

b. an adjacent region of said semiconductor material disposed for receiving said charge packet from said light sensing element;

c. means for controlling the transfer of said charge packet from said light sensing element to said adjacent regions; and

d. charge sink means having a contact for applying a bias thereto buried within said semiconductor material and disposed for receiving excess charge accumulated in said light sensing element, said charge sink means extending laterally from said contact toward said light sensing element while beneath the surface of said semiconductor material.

Claim 3 reads:

3. Structure as defined in claim 1, wherein said charge sink means comprises a region of conductivity type opposite to that of said semiconductor material.

Claims 7 and 8 read:

7. A method of operating a charge-coupled imaging device formed in semiconductor material

containing at least one light sensing element and a charge sink region having a contact for applying a first potential thereto located beneath the surface of said semiconductor material and extending laterally from said contact toward said at least one light sensing element, which comprises:

a. accumulating packets of charge in said at least one light sensing element; and

b. allowing excess charges within said at least one light sensing element to transfer to said charge sink region by applying said first potential to said charge sink region during a selected time interval.

8. A method as defined in claim 7 further including the step of preventing the accumulation of said packets of charge within said light sensing element by applying a second potential to said charge sink means during a second time interval.

United States Patent 3,896,485.

On October 18, 1995, this court construed, among other things, element d of claim 1 of the '485 patent. *Loral Fairchild Corp. v. Victor Co. of Japan*, 1995 WL 630038 (E.D.N.Y. Oct. 18, 1995). The parties' dispute over claim 1 centered mainly around the charge sink means — in structure and location. The court concluded "charge sink means" describes a means-plus-function limitation. The specification, in turn, describes the structure of the charge

sink means as a region of semiconductor material doped outside from its surrounding semiconductor material. The court also found the charge sink means did not include its associated depletion region. The court interpreted "buried within" to require the charge sink means to be completely surrounded by semiconductor material and not in contact with any surface of the device. The court concluded "a contact" describes one or more paths for charge to flow to and from the charge sink means. Finally, the court found "extending laterally from said contact toward said light sensing element" requires the charge sink means to extend parallel to the top surface and perpendicular to a contact toward the light sensing element.

Following this court's Opinion and Order, Sony filed a renewed motion for summary judgment of non-infringement of claims 1, 3, 7 and 8 of the '485 patent. In its motion, Sony contends that none of its CCDs contain the limitations in element a or d of claim 1. Because Sony also interpreted claims 7 and 8 to describe uses of the structure in claim 1, Sony also contends the methods of use described in claims 7 and 8 do not describe methods of using its CCDs. For this motion, Loral concedes Sony's CCDs do not have a light sensing element as literally described in claim 1. Because Loral agrees the light sensing element of claims 7 and 8 is the same as that described in claim 1, this court grants Sony's motion on literal infringement.

Sony also contends that its CCDs cannot infringe under the doctrine of equivalents because they lack a structural equivalent to the charge sink means in element d of claim 1 as that element has been defined by the court. Sony again

argues that because claims 7 and 8 merely describe methods of using the structure of claim 1, it cannot infringe those claims as well under the doctrine of equivalents.

The Federal Rules of Civil Procedure permit entry of summary judgment only in the absence of genuine issues of material fact. Fed. R. Civ. P. 56(c); *C.R. Bard, Inc. v. Advanced Cardiovascular Systems, Inc.*, 911 F.2d 670, 672 (Fed. Cir. 1990). In considering a summary judgment motion, this court resolves all justifiable inferences in favor of Loral, the nonmovant. *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255 (1986); *Palumbo v. Don-Joy Co.*, 762 F.2d 969, 973 (Fed. Cir. 1985). Only where no reasonable jury could find for Loral can this court enter summary judgment. *Anderson*, 477 U.S. at 255.

The parties dispute the presence of an equivalent of element d of claim 1 of the '485 patent. The Federal circuit has indicated that "the fundamental inquiry with respect to equivalency is whether the accused device is substantially the same as the patented invention, affirming the utility of the function/way/result test for substantial identity, and the relevance of objective considerations such as copying or independent development." *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, No. 95-1066, slip op. at 5 (Fed. Cir. Dec. 14, 1995). While the doctrine of equivalents provides no license to ignore claim limitations, it "does not require a one-to-one correspondence of components." *Id.* at 6 (citing *Dolly, Inc. v. Spalding & Evenflo Cos.*, 16 F.3d 394, 398 (Fed. Cir. 1994)). Moreover, genuinely disputed material facts relevant to infringement under the doctrine of equivalents must be resolved by a jury consistent with the

Appendix G

Seventh Amendment to the United States Constitution. *Hilton-Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512, 1522 (Fed. Cir. 1995) (per curiam) (en banc); Fed. R. Civ. P. 56.

Sony grounds its motion on the absence of an equivalent charge sink means in claim 1 of the '485 patent. In response, Loral contends Sony's CCDs contain both an equivalent under 35 U.S.C. § 112 (1988) or an equivalent by way of the doctrine of equivalents. For example, Loral's technical expert witness, Juliana Manoliu, identifies a charge sink means and contact in a sworn affidavit submitted in opposition to Sony's motion. She further indicates each limitation of the charge sink means appears as she has identified them in Sony's accused CCDs. Finally, Ms. Manoliu opines that the charge sink means in Sony's CCDs electrically equates to that described in the '485 patent. Dr. Barbe, another expert for Loral, opines similarly on the presence of the charge sink means in Sony's accused CCDs.

Loral also alleges that those skilled in the art clearly knew of the interchangeability of the Sony HAD light sensing element. The skilled artisan also knew the HAD and MOS light sensing elements perform the same function in the same way to achieve the same result, according to Loral.

Lastly, Loral contends claims 7 and 8 do not contain the same structural limitations as claim 1. For example, the words "buried within" appear nowhere in claims 7 and 8. Sony argues Loral should be precluded from altering its position in this case prior to the court's claim construction opinion that claims 7 and 8 merely delineate a method of operating

the structure defined in claim 1. Unless Sony can demonstrate a right to relief, the court will address the scope of claims 7 and 8 in the final jury instructions.

Viewing the evidence in a light favorable to Loral which this court must in deciding a motion for a summary judgment, the court finds genuine issues of material fact remain as to whether Sony's accused CCDs infringe under the doctrine of equivalents.

Consequently, IT IS HEREBY ORDERED as follows:

1. Sony's motion for a summary judgment of non-infringement of the '485 patent is granted as to the issue of *literal* infringement only. Sony's motion is denied in all other respects.

2. As indicated by the court during the December 11, 1995, oral argument and as further supplemented below, Toshiba's motion for a summary judgment of invalidity of the '485 patent is denied. Toshiba's motion appears to be an effort to argue its non-infringement case where the court's earlier orders expressly prohibited such a filing. Furthermore, the Michon prior art reference offered by Toshiba *clearly* does not anticipate the claims at issue of the '485 patent.

3. The court will interpret claims 7 and 8 of the '485 patent as part of the final jury instructions.

s/ Randall R. Rader
RANDALL R. RADER,
CIRCUIT JUDGE
(Sitting by Designation)

Dated: December 15, 1995

APPENDIX H — ORDER OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK GRANTING IN PART AND DENYING IN PART SONY'S MOTION FOR A SUMMARY JUDGMENT OF NON-INFRINGEMENT OF THE '674 PATENT DATED DECEMBER 14, 1995

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

Civil Action No. 92-0128-ARR
(Consolidated)

LORAL FAIRCHILD CORPORATION,

Plaintiff,

v.

VICTOR COMPANY OF JAPAN, LTD., et al.,

Defendants.

Civil Action No. 91-5056-ARR

LORAL FAIRCHILD CORPORATION,

Plaintiff,

v.

MATSUSHITA ELECTRIC INDUSTRIAL
COMPANY, LTD., et al.,

Defendants.

Appendix H

ORDER GRANTING IN PART AND DENYING IN PART SONY'S MOTION FOR A SUMMARY JUDGMENT OF NON-INFRINGEMENT OF THE '674 PATENT

Loral Fairchild Corporation ("Loral") alleges that defendants infringed claim 1 of United States Patent 3,931,674. The '674 patent discloses a process to manufacture charge coupled devices ("CCDs"). Defendants assert numerous defenses including invalidity, non-infringement, and lack of ownership. As to Sony, the court has scheduled this case for trial before a jury beginning on January 8, 1996.

On October 18, 1995, the court issued an Opinion and Order construing disputed portions of claim 1 of the '674 patent. Subsequently, the court granted leave to the parties to renew several motions for summary judgment. Sony renewed its motion for a summary judgment contending no infringement of the '674 patent's claim 1 either literally or under the doctrine of equivalents. Because Sony met its burden for literal infringement but not for infringement under the doctrine of equivalents, this court grants Sony's motion in part and denies it in part.

BACKGROUND

Claim 1 of the '674 patent reads:

> 1. A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of

[1] selectively applying at least one layer of insulation material to said semiconductor substrate;

[2] selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;

[3] forming a first insulation layer over said plurality of first gate electrodes;

[4] forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the vertical edges of the insulation layer on the respective first gate electrodes;

[5] selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, each of said second gate electrodes substantially occupying the space between adjacent first gate electrode; and

[6] connecting each of said second gate electrodes to an individual adjacent first

gate electrode to form a composite electrodes for a charge coupled element.

United States Patent 3,931,674 (bracketed numbers added for reference purposes).

In earlier submissions, Loral contended that claim 1 of the '674 patent expressed no particular order for the performance of the process steps. According to Loral, claim 1 described a process which implanted barrier regions both before and after insulation of the first gate electrodes. Loral considered the claim open-ended, without any sequence requirement for the six listed steps.

On October 18, 1995, this court construed, among other things, claim 1 of the '674 patent. *Loral Fairchild Corp. v. Victor Co. of Japan*, 1995 WL 630038 (E.D.N.Y. Oct. 18, 1995). In view of the claim language, patent specification, prosecution history, and expert testimony, this court concluded that claim 1 literally describes the use of an insulated gate as a mask. Thus, the literal scope of claim 1 requires performance of step [3] before step [4].

Following this court's Opinion and Order, Sony filed a renewed motion for a summary judgment of non-infringement of claim 1 of the '674 patent. In its motion, Sony contends that none of its processes for manufacture of CCDs perform the insulation step of the '674 patent before implantation of the barrier region. Sony makes CCDs with processes which use an uninsulated gate as a mask when implanting barrier regions. For this motion, Loral concedes Sony's processes perform implantation in this manner. Because the literal

scope of claim 1 of the '674 patent requires insulation before implantation, this court grants Sony's motion on literal infringement.

However, Sony also contends that amendments and statements during the course of the prosecution of the '674 patent estop Loral from claiming equivalents encompassing Sony's processes. In particular, Sony argues the applicant, to overcome prior art, surrendered coverage of a process that uses an uninsulated or naked gate as a mask to implant the barrier regions.

DISCUSSION

The Federal Rules of Civil Procedure permit entry of summary judgment only in the absence of genuine issues of material fact. Fed. R. Civ. P. 56(c); *C.R. Bard, Inc. v. Advanced Cardiovascular Systems, Inc.*, 911 F.2d 670, 672 (Fed. Cir. 1990). In considering a summary judgment motion, this court resolves all justifiable inferences in favor of Loral, the nonmovant. *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255 (1986); *Palumbo v. Don-Joy Co.*, 762 F.2d 969, 973 (Fed. Cir. 1985). Only where no reasonable jury could find for Loral can this court enter summary judgment. *Anderson*, 477 U.S. at 255.

Recently, the United States Court of Appeals for the Federal Circuit reaffirmed and clarified the doctrine of equivalents. *Hilton-Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512 (Fed. Cir. 1995) (per curiam) (en banc). In *Hilton-Davis*, the Federal Circuit narrowed the fact-based focus of infringement under the doctrine away from the

tripartite function-way-result test in favor of the "substantiality of the differences between the claimed and accused products or processes, assessed according to an objective standard." *Id.* at 1518. In assessing the substantiality of the differences, the Federal Circuit made that a wide range of evidence relevant. The court stated:

> [A] finding of infringement under the doctrine of equivalents requires proof of insubstantial differences between the claimed and accused products or processes. Often the function-way-result test will suffice to show the extent of the differences. . . . Other factors, however, such as evidence of copying or designing around, may also inform the test for infringement under the doctrine of equivalents. No judge can anticipate whether such other factors will arise in a given case. Instead, the presence of such factors will depend on the way the parties frame their arguments.

Id. at 1522. In *Hilton-Davis*, the court also reaffirmed the fact-based nature of the test as well as a party's right to a jury resolution under the Seventh Amendment to the United States Constitution. *Id.*

Prosecution history estoppel, however, continues to limit the permissible scope of equivalents. An applicant's statements or amendments during prosecution can estop the patentee from later reclaiming under the doctrine patent coverage surrendered to acquire exclusive rights. *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1218 (Fed. Cir.

1995). To determine the scope of coverage relinquished during prosecution, the Federal Circuit counsels this court to objectively consider what a competitor reasonably would devine from the file history of the patent. *Mark I Marketing Corp. v. R.R. Donnelley & Sons Co.*, 36 U.S.P.Q.2d (BNA) 1095, 1100 (Fed. Cir. 1995). The Federal Circuit has also explained:

> Under [prosecution history estoppel], a patentee cannot recapture through equivalence certain coverage given up by argument or amendment during prosecution. That is not to say, however, that, whenever a limiting amendment or argument is made during prosecution, the patentee loses all coverage between what the claims literally cover and what they would have covered prior to the amendment or argument. . . . Instead, depending on the nature and purpose of an amendment, it may have a limiting effect within a spectrum ranging from great to small to zero.

Hormone Research Found. v. Genentech, Inc., 904 F.2d 1558, 1564 (Fed. Cir. 1990).

Thus, the extent of an estoppel due to prosecution history depends on an evaluation of the facts and circumstances surrounding "what was surrendered" and "the reason[s] for such a surrender." *Id.* As a result, "the scope of estoppel can depend on factual questions regarding the prosecution history, which may be disputed and preclude a disposition of the issue on summary judgment." *Id.*; *see also Wang Labs., Inc. v. Toshiba Corp.*, 993 F.2d 858, 866-68 (Fed. Cir. 1993)

(addressing prosecution history estoppel in a post-verdict motion for judgment as a matter of law); *Laitram Corp. v. NEC Corp.*, 952 F.2d 1357, 1361-62 (Fed. Cir. 1991).

Claim 1, as originally filed, read, in relevant part:

> 1. A process for fabricating a semiconductor structure comprising the steps of:
>
> > selectively forming a plurality of spaced-apart first gate electrodes;
> >
> > selectively forming second gate electrodes between and spaced slightly apart from adjacent ones of said first gate electrodes; and
> >
> > forming barrier regions in a semiconductor substrate beneath said second gate electrodes, said barrier regions extending in said substrate beyond a boundary defined by the outer perimeter of said second gate electrodes toward but not reaching an outer boundary defined by the outer perimeter of said first gate electrodes, thereby providing barrier regions having outer boundaries precisely aligned between the boundaries of said first and said second gate electrodes.

Appendix H

Claim 2 read:

> 2. The process as recited in claim 1 and further comprising the step of forming a first insulation layer over said first gate electrodes prior to the step of forming barrier regions in said semiconductor substrate, whereby the outer lateral surfaces of said first insulation layer are aligned with the corresponding surface of said barrier region.

The applicant then filed a preliminary amendment cancelling claims 1-10 and adding claims 17-27. Amended claims 17 and 18 read:

> 17. A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of:
>
> selectively applying at least one layer of insulation material to said semiconductor substrate;
>
> selectively forming a plurality of spaced-apart first gate electrodes on the uppermost surface of said at least one layer of insulation material;
>
> forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the

edges of said implanted barrier regions being aligned with the respective first gate electrodes; and

selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, one of said second gate electrodes substantially occupying the space between each of said plurality of first gate electrodes.

18. The process as recited in claim 17 further comprising the step of forming a first insulation layer over said plurality of first gate electrodes prior to the step of forming implanted barrier regions in said semiconductor substrate, whereby the edges of said implanted barrier regions are aligned with the vertical edges of the first insulation layer on the respective first gate electrodes.

In the remarks section of the amendment, the applicant amended the claims "in order to ensure that they particularly point out and distinctly claim the invention taught by the application."

The examiner rejected claims 17 and 18 as vague and indefinite under 35 U.S.C. § 112 and as obvious under 35 U.S.C. § 103. The examiner also rejected claim 17 as anticipated under 35 U.S.C. § 102. As to the section 112 rejection, the examiner explained:

Appendix H

> In claim 17, the edges of the implanted barrier regions are not aligned with the first gate electrodes but are aligned with the oxide surface covering the first gate electrodes and it is not clear that only one second electrode occupies the spaces between all of the first gate electrodes. Also, no apparent relationship has been set forth between the two sets of gate electrodes and the barrier region.

As to the section 103 rejection, the examiner found claims 17-20 "unpatentable over Walden [United States Patent 3,852,799] in view of Boleky [United States Patent 3,745,647]." The examiner explained: "It is considered obvious that the oxide surrounding Walden's first regions 46, 49 etc. may be used as a mask in forming his regions 43, 45 etc. as in Boleky at 20." The section 102 rejection bears no relevance to the issues in this motion.

In response to this Office Action, the applicant amended claim 17 and cancelled claim 18. Amended claim 17 read:

> 17. (amended) A process for fabricating a charge coupled device structure in a semiconductor substrate, comprising the steps of
>
> > selectively applying at least one layer of insulation material to said semiconductor substrate;
> >
> > selectively forming a plurality of spaced-apart first gate electrodes on the

uppermost surface of said at least one layer of insulation material; *forming a first insulation layer over said plurality of first gate electrodes;*

forming implanted barrier regions in said semiconductor substrate in the intervals between said plurality of spaced-apart first gate electrodes, the edges of said implanted barrier regions being aligned with the *vertical edges of the insulation layer on the* respective first gate electrodes; and

selectively forming a plurality of second gate electrodes on said uppermost surface of said at least one insulating layer between said plurality of spaced-apart first gate electrodes, one of said second gate electrodes substantially occupying the space between each of said plurality of first gate electrodes [.] *, each of said second gate electrodes comprising in combination with an individual adjacent first gate electrode a composite electrode for a charge coupled element.*

(bracketed material deleted, underlined material added). In the Remarks section of the amendment, the application explained:

Appendix H

> [T]he Examiner points out that in the original claim the implanted regions are not, in fact, aligned with the first gate electrode but are aligned with the oxide surface covering the first gate electrodes. The cancellation of claim 18 and the addition of a new step to claim 17 as well as additional language in claim 17 results in the correct recitation that the implanted barriers are aligned with the vertical edges of the first insulation layer over the respective first gate electrode.

As to the obviousness rejection, the applicant explained:

> It is submitted that the thrust of the Boleky reference is the lateral inward diffusion of the dopant impurities as shown by the points of penetration 40. The use of the insulated gate as a mask shows a technique that is generally known in the semiconductor art. The present invention is directed to a process sequence which includes this masking feature as one step but which further includes the unique and distinctive steps of connecting a single first gate electrode to a single adjacent second gate electrode to form a composite gate electrode. Thus, not only is self-alignment of the implanted barriers obtained, but a composite electrode for inclusion in a charge-coupled element is formed. This sequence of steps goes far beyond the teaching of Boleky and, therefore, is not rendered obvious by it.

Appendix H

Sony contends the statements about and amendments to then-claim 17 estop Loral from claiming infringement under the doctrine of equivalents for a process which uses naked gates as a mask to implant the barrier regions. Sony characterizes the prosecution of the '674 patent in the following manner. The examiner's section 112 rejection concluded that the applicant disclosed alignment of the edges of the barrier regions with the oxide surface (suggesting insulation first), not with the edges of the first gate electrodes (suggesting implantation first). The applicant, in response, folded then-claim 18, requiring insulation first, into claim 17, placing the insulation step before the implantation step in claim 17. Finally, the applicant added language to the claim requiring vertical alignment of the barrier region with the edges of the insulation layer. These amendments, according to Sony, show the inventor limited the process to the use of an insulated gate as a mask.

Further, according to Sony, the applicant characterized then-claim 17 as "directed to a process sequence" which included the specific "masking feature" of an insulated gate as "one step." The applicant then stated that the sequence of steps goes beyond the teachings of the cited prior art. These characterizations overcame the obviousness rejection and resulted in allowance of the claims. According to Sony, these statements confirm the limited scope of the claim.

Loral presents a different characterization of the prosecution events. Loral places the entire exchange in the context of general knowledge of the interchangeability of insulated and uninsulated gates as ion implantation masks at the time of this invention. In fact, the specification of the

'674 patent at column 4, lines 57-59 and Figure 3, describes the use of an uninsulated gate as a mask for ion implantation, according to Dr. Tiemann, a technical expert for Sony.

The original claims in the application clearly described the use of an insulated or uninsulated gate as a mask. However, according to Loral, the applicant's attorney mistakenly changed the language in the preliminary amendment to delineate alignment of the implanted barrier regions with the first gate electrodes rather than with the oxide surface covering the first gate electrodes as the inventor had originally described. This error, according to Loral, resulted in the section 112 rejection. In other words, Loral contends that one reading the prosecution history would discern that the examiner recognized the attorney error in drafting the preliminary amendment.

The applicant then amended the claims to return more closely to the form the inventor had originally specified. Loral focuses on the added language "aligned with the vertical edges of the insulation layer." (emphasis added to show plural). According to Loral, the use of an insulated or uninsulated gate as a mask will align the implanted barrier regions between the vertical edges of the insulation layer over each first gate electrode just as the added language requires. Loral's experts testified on this point during the court's *Markman* proceeding in September.

Moreover, Loral contends the applicant did not amend the claims to overcome the prior art. Loral notes the applicant specifically stated the claim amendments responded solely to the section 112 rejection. The statements in response to

the section 103 rejection merely highlighted to the examiner that the combination of steps claimed in the '674 patent, including the use of an insulated gate as a mask, was not obvious in view of the cited references. In fact, Boleky apparently shows the use of an insulated gate as a mask. Rather than argue the claims did not use that process, the applicant agreed that such a sequence was well known in the art.

Most important, according to Loral, the applicant did not limit the claims to a particular sequence or state that the claims did not cover prior art which disclosed the use of an uninsulated gate as a mask.[1] Instead, the applicant noted that this invention includes more than the well-known technique of using an insulated gate as a mask, namely the entire combination of the '674 patent. Thus, according to Loral, the knowledge of those skilled in the art about the interchangeability of these process steps coupled with the nature of the amendments and statements during prosecution render summary judgment on prosecution history estoppel improper.

Loral presents a plausible view of the facts and circumstances surrounding the prosecution of the '674 patent. Viewing the evidence in a light favorable to Loral, as this motion requires, this court cannot conclude on the record before it that Loral surrendered coverage of a process using

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1. In light of the more pointed and conclusive statement required for an estoppel, *see Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, No. 95-1066, slip op. at 7-9 (Fed. Cir. Dec. 14, 1995), this court does not view this argument as entirely inconsistent with its claim interpretation opinion of October 18, 1995.

an uninsulated gate as a mask for implantation. In the context of this amendment, Loral shows enough evidence to suggest that the applicant may not have disavowed coverage of a particular element. Nowhere in the prosecution history, for instance, does the applicant state that the claim does not cover the use of a naked gate as a mask. Furthermore, nowhere in the prosecution history does the applicant distinguish his invention from prior art because it uses only an uninsulated gate as a mask. Rather, the applicant appears to have focused on a particular process sequence in describing the invention to the examiner. The applicant said far more about what the process does include than what it does not include. The applicant's reference to the sequence going beyond Boleky may have been a way of pointing out to the examiner that Boleky merely describes one or two steps in the broader combination process of the '674 patent. Under the evidentiary burdens associated with a summary judgment motion, this court denies Sony's motion.

Consequently, IT IS HEREBY ORDERED that Sony's motion for a summary judgment of non-infringement of the '674 patent is granted as to the issue of *literal* infringement only. Sony's motion is denied in all other respects.

s/ Randall R. Rader
RANDALL R. RADER,
CIRCUIT JUDGE
(Sitting by Designation)

Dated: December 14, 1995